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A PRELIMINARY ANALYSIS OF AN OBSERVATION SCHEDULE DESIGNED TO
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OBSERVATION (RESEARCH), GUILFORD, BLOOMINGTON, INDIANA,
DENNY-RUSCH-IVES CLASSROOM OBSERVATION SCHEDULE

THE PURPOSE OF THE RESEARCH WAS TO CONDUCT A PRELIMINARY ANALYSIS OF THE DENNY, RUSCH, IVES CLASSROOM OBSERVATION SCHEDULE DESIGNED TO IDENTIFY THE COMPLEX OF TEACHER AND PUPIL BEHAVIORS WHICH CONTRIBUTE TO PUPIL GAIN IN CREATIVITY. INTERRELATIONS OF PUPIL GAINS IN CREATIVITY WITH TEACHER PUPIL BEHAVIOR VARIABLES WERE ANALYZED. THE SAMPLE WAS LIMITED TO 30 SIXTH-GRADE CLASSROOMS WITHIN A 90-MILE RADIUS IN A MIDWESTERN STATE. MEAN IQ RANGED FROM 92 TO 117. MEAN SOCIOECONOMIC RATINGS RANGED FROM 3.67 TO 5.57 ON A SEVEN-POINT SCALE. MOST TEACHERS HELD B.S. DEGREES AND HAD TAUGHT SIXTH GRADE AN AVERAGE OF 7.33 YEARS. CREATIVITY WAS MEASURED USING A BATTERY OF TESTS PREPARED BY J.P. GUILFORD. PRETESTS AND POST-TESTS WERE ADMINISTERED. TEST VALIDITY WAS CHECKED BY CORRELATION OF EACH SUBTEST WITH A PEER NOMINATION AND INTEREST INVENTORY. OBSERVATIONS WERE MADE BY A TEAM OF THREE OBSERVERS WHO WERE TRAINED FOR THE OBSERVATION VISITS. THREE RANDOMLY SCHEDULED VISITS WERE MADE TO EACH OF 30 CLASSROOMS. ANALYSIS OF OBSERVATIONS AND ANALYSIS OF VARIANCE WERE USED. CONCLUSIONS INDICATED--(1) SCHEDULES SEEMED TO DIFFERENTIATE BETWEEN CLASSROOMS, (2) OBSERVATION SCHEDULE ITEMS SEEMED TO MEASURE DIFFERENT ASPECTS OF TEACHER-PUPIL BEHAVIOR, (3) BEHAVIORS SEEMED TO DIFFER FROM SITUATION TO SITUATION IN A SAMPLE OF THREE VISITS, (4) THE SCHEDULE SEEMED TO BE OBJECTIVE, (5) OTHER SOURCES OF VARIANCE WERE NOT ACCOUNTED FOR IN THE ANALYSIS OF THE SCHEDULE, (6) IDENTIFIED CHANGES IN THE OBSERVATION SCHEDULE MAY IMPROVE THE RELIABILITY, (7) RELIABILITY AND OBJECTIVITY COEFFICIENTS WERE EQUAL TO OR GREATER THAN PREVIOUSLY REPORTED SCHEDULES, AND (8) THE SCHEDULE WAS VALID FOR DIFFERENTIATING BETWEEN HIGH OR LOW MEAN-GAIN CLASSROOMS ON FLEXIBILITY AND REDEFINITION. (HB)

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A PRELIMINARY ANALYSIS OF AN OBSERVATION SCHEDULE DESIGNED TO IDENTIFY THE TEACHER-CLASSROOM VARIABLES WHICH FACILITATE PUPIL CREATIVE GROWTH

Cooperative Research Project No. 6-8235-2-12-1

by

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Special thanks are extended to Dr. Ronald C. Welch, who served as both doctoral committee chairman and director of the thesis, and whose wise guidance over the total period of doctoral study, particularly in the writing of the thesis, was most appreciated. Dr. H. Glenn Ludlow and Dr. Harold F. Brinegar, committee members, also deserve thanks for their support during this period. In matters pertaining to the design and statistical analysis, the writer wishes to thank Dr. Richard Turner for his expert advice and assistance.

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Acknowledgment and thanks are extended to the school systems, their superintendents, supervisors, and principals, who gave of their time and to the teachers and pupils who suffered being observed as part of this study.

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CHAPTER I

INTRODUCTION

If to possess knowledge is to be educated, then an encyclopedia is better educated than a man.

-David Page

We must become aware of what I call "inert ideas"--ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh combinations.

-Alfred North Whitehead

There is a difference between the accumulation of factual knowledge and its use in developing originality of thought. It is generally agreed that there is a need to teach children how to think, not only logically but creatively. The importance of factual knowledge is not minimized. It is recognized, however, as a means to thinking and communicating, a means which must combine with creative thought to develop rational power.

With this in mind, it is somewhat alarming to find the creative spark which exists in early childhood dimming as the individual moves toward adult life. It would seem that both the school and society tend to oppose rather than foster the development of creativity (115:101-02)*.

It is possible that developing individuals who think creatively may well be the key to future survival! Creative thinkers are needed in all areas of life--political, social, and economic. This is especially so in a society undergoing rapid technological change with its resultant social change, tensions, and confusion. A rigid, unresourceful, habit-bound people will resist necessary changes and will be unable to cope with the unique needs of the times.

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*Numbers in parentheses refer to numbered references in the bibliography; those after the colon are page numbers.

Educators are looking forward to the possibility of highly accurate teacher specification of the behavioral results of instruction, possibly the full control of human behavior. Individualism may suffer unless as much attention is paid to the development of creative behavior as is paid to conforming behavior and academic performance (19).

The general problem which confronts education is how to achieve its goals; how to teach in a manner which will result in the desired pupil behavior. Indeed, this has been the historical problem of education. In an attempt to solve this problem of goal achievement, educational research has concerned itself with studies of the way children learn and of methods of instruction to effect such learning. At best, the results of such research have been ineffective, conflicting, and often confusing. Only in the past decade have researchers begun to analyze teaching in a behavioral, empirical context rather than the global comparison of methods and materials of instruction as done in former years. As these studies of teacher effectiveness have accumulated, the realization of the complexity of teacher-pupil interaction and the variability of teacher effectiveness in different contexts has resulted in extensive investigation which will eventually result in a body of data and concepts concerning teacher-pupil interaction (15:39-40). The unique contribution of research in this field during the last decade has been the utilization of time-sampling observation procedures which allow the study of teacher and pupil behavior in the natural classroom setting (43:1-814).

Paralleling the development in educational and psychological research have been the investigations dealing with intellectual development which have focused upon the creative aspects of the intellect. Although there have always been philosophical theories dealing with man's creativity (63:18-46), it has only been in recent years that the research psychologists have taken a great interest in creativity. As a result there has been an increase in relevant research upon which to base changes in teaching procedures.

This investigation is made possible by the intersection of two lines of research, one dealing with creativity development in the individual and the other exploring teacher effectiveness through an analysis of teacher-pupil interactions by time-sampling observation methods. The utilization of time-sampling observation methods in creativity research should eventually result in designs for teacher behavior which will effect pupil creative development. This study is viewed as a step in that direction.

The Problem

This study is concerned with a part of the sequence of steps leading to classroom instruction which will foster pupil creative growth. The purpose of the research is to conduct a preliminary analysis of the Denny, Rusch, Ives Classroom Observation Schedule designed to identify the complex of teacher and pupil behaviors which contribute to pupil gain in creativity. More specifically, the analysis explores the schedule's objectivity, reliability, and validity in relation to a particular sample of sixth grade classrooms. Interrelations of pupil gains in creativity with pupil-teacher variables are analyzed.

Definitions, Limitations, and Underlying Assumptions

Definitions. "Creativity" is defined for the purposes of this study as a process which redefines or reorganizes, with new insights, that which is already known into a product of understanding of significance to the individual child, his peer group, or society as a whole. This mental process is only now under examination by researchers. Guilford, however, has found, through factor analytic procedures, a number of intellectual aspects which would seem to subsume under the broad definition given above (47). Five of these aspects were used as the criterion variable in this study:

Ideational fluency
Spontaneous flexibility
Redefinition
Originality
Sensitivity to problems

Although these aspects of creativity can be considered only tentative indices of the entity, they do appear to be the best available at the present time, having been substantiated first by Lowenfeld independently of Guilford (66) and in replication by Torrance (115). Guilford's tests of these aspects have been modified for use at the sixth grade level.[*]

"Teacher-pupil behaviors" are those observable activities, both verbal and nonverbal, which teachers and pupils exhibit in the classroom situation.

"Reliability" refers to the accuracy of the measurement. It refers to the true score, to the typical classroom behavior that would be observable over a period of time, only a sample of which is actually observed, and also to the actual behavior as contrasted with what an observer sees.

"Coefficient of observer agreement" refers to correlation of scores made by different observers at the same time. It is an indication of the objectivity of the observation schedule, since all the observers will have an equal chance to observe the same behaviors. Differences in their scores reflect the subjectivity of the schedule (72:253-254).

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[*] See Appendix B for a description of the tests as modified, and a rationale for their use based upon the research of Guilford and others.

"Concurrent validity" refers to the ability of the schedule to differentiate between high and low creativity gain in the classrooms.

"Construct validity" refers to the degree to which the items of the schedule intercorrelate to form dimensions similar to those hypothesized in the schedule construction.

Limitations. The analysis of the observation schedule is limited to a sample of 30 sixth grade classrooms in a Midwestern state. The grade level limitation is imposed by the nature of available tests of the dependent criterion variable. The study is preliminary in that future longitudinal studies based upon these findings are anticipated to determine the schedule's validity generalization to other different samples (teachers, grade levels, and geographic areas) and criterion measures (other creativity tests, products, et cetera).

Assumptions. The study utilizes much of the theoretical basis proposed and utilized by Ryans (99;95) and Smith (106). The assumptions utilized are summarized below:

1. Teacher behavior is information processing and the teacher is an information system. Teacher information processing (decision making), interacts with and mediates between the inputs (conditions) influencing the teacher and the observable teaching response to a particular situation.

2. The learner may also be described as a system of "outputs," "inputs," and "mediating" factors. The two systems (teacher and pupil) interact.

3. Teacher behavior is relative to the activities expected of the teacher and to the pupil behavior (learning) desired.

> Thus the communication of information may take several forms, and purposes may vary. Yet, for a given teacher, there will be some degree of consistency and a limited number of available responses.

4. Teacher and pupil behavior is observable. It is distinguishable, classifiable qualitatively and quantitatively, and revealed by overt behavior and by symptoms or by correlates of behavior.

In the statistical analysis it is assumed the classrooms observed are a random sample from the same population of teachers and that the observing team is also randomly selected from a population of possible observers.

CHAPTER II

REVIEW OF RELATED RESEARCH AND LITERATURE

Research on Creativity

Identification and relationship to measured intelligence. Although as long ago as 1898 Dearborn investigated the relative independence of intelligence and imagination (29), it has been during only the last 15 years that educational research has concentrated its attention on this area. Also during this time there has been a marked increase in articles and books dealing with the topic in more subjective terms. Perhaps the increased interest has been unfortunate for it has resulted in the misconception by the general public and by many professional educators that the research on creativity is much more definitive than it actually is. As a matter of fact, much of the research has been poorly designed and unjustifiable conclusions have been drawn (114;104).

The critics have pointed out that in a number of studies the restricted range of intelligence of samples tested has resulted in faulty conclusions about the relationship of I. Q. to creativity measures (125;104;81;87;88;103), yet subsequent research has shown that the aspects measured as "creative" by so-called creativity tests, although positively correlated with measured intelligence, are not highly so (they range from .20 to .41), especially in the group beyond 120 I. Q. (125;101;103).

The definition of creativity, as a composite, has been attacked as not valid when aspects of the intellect as measured by the Guilford Tests are found to have such low, positive intercorrelations (114). It can also be argued, however, that they are related because there are low, positive correlations between subtests yet they measure separate aspects of the intellect. A high positive correlation would not only indicate they were better related but would also indicate they overlapped, all measuring the same thing.

A conservative conclusion would seem to be that there are aspects of the intellect which are not measured by intelligence tests, but they are aspects of a whole and are interrelated. These could be called aspects of "creativity." As originally developed through the independent research of Guilford (47) and Lowenfeld (66) these are defined as fluency, flexibility, sensitivity, originality, and redefinition.

Tests of these aspects have been developed and have undergone revision by Guilford as well as others (116). The critics raise the question of the validity of the tests and the aspects they measure. In reply, Guilford presents a realistic view of the problem involved in determining originality. Since there is no way of knowing whether an idea ever existed before, and one would need to know the history of the individual to know whether the idea is new to him, there are left two ways to determine originality empirically. One would be to determine the statistical frequency of a response in a population. The other would be to judge its social usefulness, but here subjectiveness enters the picture (48). Through factor-analysis related aspects can be determined. Next steps would be to determine whether these factors relate to "creative" or "gifted" performance (48). Guilford's studies have dealt with the factor analysis.

Subsequent studies, in which Guilford's tests or tests purporting to measure similar aspects of creativity are compared to criterion variables, seem to substantiate their independence of intelligence test scores for some children (the high creatives - low I. Q.'s) and the positive relationship of I. Q. and creativity with a correlation at about the .50 level for children below 120 I. Q. (30;81;103). High creatives are also found to achieve at a high level on standard achievement tests (30;103). Other studies seem to substantiate Guilford's findings that general creativity is rare, that individuals differ in the kind of creativity (symbolic, verbal, concrete) (48). Jones noted this difference when semantic creativity tests were related to writing more than to creative drawing (61). Bowers study of fourth, fifth, and sixth grade children also differentiated between aspects of creativity (17:141-142). A pilot study by Rusch, Denny, and Ives indicated these same aspects of "creativity" could be used to design a test for the dramatic arts (93).

One might safely conclude, from the research dealing with the identification of aspects of the intellect, that these aspects are factors which differ from intelligence, as measured, and which have low positive correlations and thus relate to form factors which are varied in pattern and relationship.

Although investigation of the development of creativity might be criticized as premature in light of the limited stage of research defining creativity and of test development, it is the opinion of many in education that the factors measured by the tests developed to date are important in themselves, whether labled creativity or simply ideational fluency, originality, et cetera. A study of the factors contributing to differences in individuals as measured by these tests should contribute to the fund of knowledge, and subsequently to changes in instructional procedures.

Effect of socioeconomic status and home relationship on development. When considering the development of creativity in the classroom it is necessary to isolate the classroom from other possible sources of encouragement. The home situation and related socioeconomic status is a logical competing environmental factor. It is interesting to note the conflicting research results regarding this.

Getzels and Jackson cited different parental attitudes for high creative, high I. Q. subjects (45:62-74). Ellinger, in a study of 458 fourth grade children in Ohio, also found a significant relationship between home environment and creativity as measured by Torrance's tests (35). Pogue found no relationship between race and creativity but did note a relationship to socioeconomic level (87). In direct contrast, Dever found no significant relationships of creativity and parental attitudes as measured by questionnaires of 100 Negro parents in Texas (32). Orinstein, in a study of second grade children also failed to find a significant positive relationship of permissiveness, loving attitudes, and democratic attitudes of parents and pupil creativity (83). The study might be criticized because of the limited size (N=45) and the measures used. At the junior high level Rambo also failed to find significant differences between high and low creative pupils in regard to parental occupations, parents' educational level, number of children in the family, child's position in the family, and the parents with whom the child lives (88).

Since the evidence is inconclusive regarding the environmental effect of the home on creativity development and yet there is evidence to indicate that the socioeconomic status of the family is related to child rearing practices and child activities (67:112-14), any research about creativity should attempt to control this factor.

Deliberate development of creativity. Industry was the first to recognize the benefits of developing the creative potential of its employees. A closely related adjunct of this movement in industry was the formation of the Creative Education Foundation in early 1954. Through the efforts of this foundation and its yearly institute at the University of Buffalo, research in the deliberate development of creativity flourished. Most of this research tended to utilize the "brain-storming" principles of Alex

Osborn, founder of the Foundation (84:227-248). Adaptations of this procedure were developed by Sidney Parnes in cooperation with the Foundation and Dr. Osborn. Reports of the research in industry have been rapidly accumulating and have resulted in the conclusion that creativity can be developed through training programs for adults (85:343;113).

A logical corollary to the research in industry with adults was the interest in developing children's creativity. Spurred on by the findings of Torrance that the developmental curve for children's creativity was broken at the fourth, sixth, and senior high school levels (115:93) and by the fact that a survey of teacher objectives showed little emphasis upon creative development (116:5), researchers turned their attention to the development of children's creativity. Encouraging reports of the importance of education in fostering or suppressing creative potential were made by Drevdahl in a pilot study of creative and noncreative psychologists (33). Interesting, in light of Torrance's findings regarding the slump in creative development at the fourth grade level, was Johnson's finding that this is not so for Somoan children (60). Barken raised some interesting questions about the classroom conditions which foster creativity in an early study of pupil involvement in the learning activity as it relates to creative behavior (12).

A number of studies have dealt with training procedures similar to those used with adults. Anderson and Anderson experimented with "brain-storming" sessions at the sixth grade level (8). Cartledge and

Krauser used Osborn's ideas for stimulating creative thinking with first grade children (20). Myers' research, using training procedures to improve creative writing ability is typical of many in the language arts area (79). Reyburn trained six fifth grade teachers through an in-service program to use techniques which would encourage divergent production. Their pupils were compared, on tests of fluency and originality using the Minnesota Tests of Creative Thinking, with matched control groups. A significant advance by the experimental groups was found over the period of instruction (90).

All of these studies can be criticized for dealing so specifically with select aspects of creativity that few significant results were found when examination of more than the immediate criterion variable was made. They have been criticized for training for the tests rather than really developing "creativity." They can also be criticized as being limited in design and in size of population. It appears somewhat naive to believe that significant effects in pupil creative development can be achieved in the complex interaction system of the classroom through mere specialized training sessions over a short period of time. These studies have, however, stimulated more detailed examination of pupil creative development in education.

In recognition of the need to explore the total realm of the classroom situation in relation to pupil creative development, the most encouraging research has been done in what may be divided into three areas: (a) studies of teacher characteristics in an attempt to relate them to creativity development, (b) experimental studies in which a more general approach has been made to pupil creative development than in the special training studies previously described, and (c) analysis of teacher-classroom behaviors as they relate to creative development.

Teacher characteristics and creativity. Turning first to studies of teacher characteristics and pupil creative development, James, working with a sample of 27 seventh grade teachers, could only conclude that an interaction of teacher personality and pupil creative growth made further study feasible (57). He selected three high-scoring and three low-scoring teachers on the creative attitude scale of the Personal-Social Motivation Inventory. Other scales were also administered. Pupils were administered pre-post tests of creativity, using the Minnesota Tests of Creative Thinking.

Castelli, working with 61 fourth, fifth, and sixth grade teachers in the Buffalo, New York, area, found creative teachers tended to support children more than noncreative teachers and did not differ from less creative on emotional climate, verbal emphasis, and social structure of the classroom. His results were confounded by finding that creative teachers tended to shift (i. e., they both praised and blamed more, et cetera). He tested the teachers for divergent thinking and gave them the intuition scale of the Myers-Briggs Type Indicator.

The classrooms were observed twice using the OScAR device. No attempt was made to measure pupil creative development directly (21).

Yamamoto concerned himself with the effect of teachers' creative thinking ability on pupil achievement and personal-social adjustment. He studied 19 teachers and 461 pupils at the fifth grade level in a suburban school district. Teachers were observed in the classroom on three visits. No significant differences between high and low creative teachers were found in regard to their classroom behavior (teaching individual activities, teaching group activities, pupil-class activities, pupil disruptive behavior, classroom emotional climate). Only in arithmetic achievement was a significant interaction with teacher creativity found (126;128).

Spaulding, in an admittedly limited study, in which one teacher was identified as "creative" according to a theoretical construct of the creative personality, concluded that "creative" teachers do not foster superior pupil originality and cognitive flexibility (111:118). One must therefore conclude that the line of research dealing with teacher personality and pupil creativity is at best inconclusive. In fact, the evidence seems to indicate that "creative" teachers do not necessarily perform in such a way as to develop pupil creativity.

Experimental studies. The second line of research dealing with the total realm of the classroom has been the general experimental studies. These studies are characterized by experimental and control groups and the preparation of teachers of the experimental groups to develop creativity through the study of creativity and techniques of instruction. These studies tend to differ from the training research previously referred to, in that the teacher preparation is broader in scope and more related to behavior in all phases of the program.

Enochs used two experimental and two control groups at the fifth grade level, consisting of 97 pupils and four teachers (36). The Minnesota battery, measuring originality, flexibility, and fluency, was used to test the pupils. Teachers of the experimental groups were encouraged to modify their general teaching role in a way believed to develop creativity in pupils. Sixteen 42-minute video tapes were made of their teaching in the social studies area and were viewed and analyzed by means of Flander's Interaction Analysis. The teachers were reinforced for "indirect behavior" (for allowing pupils to talk more, for listening and accepting what pupils were saying, et cetera). Emphasis was placed upon developing a classroom atmosphere in which children were free to express ideas. The experimental teachers were given copies of Torrance's Rewarding Creative Behavior (117) and a list of five principles to promote creative thinking:

1. Treat pupils' questions with respect.
2. Treat unusual ideas with respect.
3. Show pupils that their ideas have value.
4. Encourage and evaluate self-initiated learning.

5. Give opportunities for practice or experimentation without immediate evaluation.

Each control classroom was observed eight times during the experimental period. Flander's device was also used to categorize control classroom behavior, but no feedback was given these teachers. Enochs found that the experimental pupils made significantly greater gain in originality than either of the control groups and significantly greater gain in flexibility than one of the control groups. All four groups made similar gains in fluency. Although conclusions are limited, since the study failed to equate the groups on intelligence and socioeconomic status and since only small numbers of teachers and pupils were involved and the creative aspects measured were limited in number, it would seem that classroom climate is a significant factor in pupil creative development.

Hutchinson, using a larger sample of 256 seventh graders, arranged eight matched groups of 32 pupils each. There were four experimental and four control groups, one pair of groups for each of the four teachers, to explore the relationship of teaching practices to pupil creative development (56). Seven tests of 10 measures of creativity were employed. Tape recordings and observation notes of classroom interaction were analyzed by means of the Aschner-Gallagher system. Although "prejudicing" his results by training his experimental teachers and their pupils during four 50-minute periods, in which techniques of "brain-storming" and group methods were taught, Hutchinson concluded that traditional methods are geared to cognitive-memory goals and the high I. Q. pupil. Experimental procedures resulted in significantly higher scores on four of the 10 measures of creativity.

Rusch, Denny, and Ives conducted an experimental study in which two experimental sixth grade classes were matched for age and I. Q. with two control classes at the same grade level (94). The two experimental teachers employed what they believed to be procedures to develop pupil creativity throughout their total class program. The instruction was characterized by:

1. A climate reinforcing pupil originality
2. Special lessons designed to develop creativity within the context of the prescribed curriculum
3. Positive motivation of pupils
4. Support of divergent thinking
5. Creation of a climate of pupil mutual respect and acceptance
6. Development of an awareness of the creative works of others
7. Pupil-teacher planning and the development of self-motivation
8. Provision of a wide variety of sensory experiences, through the use of a variety of materials of instruction in unique combination.

Each class was pre-post tested on four aspects of creativity: sensitivity, originality, fluency, and redefinition. The Guilford tests were used as well as one previously developed by the research team (93).

Analysis of co-variance was used to adjust for initial differences on the creativity measures. It was found that the experimental groups gained significantly more than the control groups on five of the seven variables assessed.

Analysis of teacher-classroom behaviors and creativity. Although the studies just described dealt with a broader concept of teacher-classroom variables related to pupil creativity development than the simple direct training studies described previously, they are limited for the most part in that the number of teachers was small, limiting generalizations (94;111;56;36), or the design was faulty, casting doubt upon results (36;56), or they failed to observe the actual classroom behavior of teachers directly but only implied the behavior from personality characteristics or philosophical orientation (94;57). Castelli (21) escapes criticism on these points, but did not explore the relationship of teacher-classroom behavior and pupil gain in creativity.

The direction to move, it would seem, would be to observe a large number of teachers in the natural classroom setting, while at the same time testing the pupils for creative growth. Equalizing other differences between classrooms one would be able to identify the teacher-pupil interaction behaviors which are significantly related to pupil creative growth. By designing studies in this manner the risk of teaching for the tests is eliminated, and a broad range of day-to-day behaviors can be identified which can later be tried out under experimental conditions.

A few studies have been reported which employ this design and which have utilized a relatively large number of teachers. Wodtke worked with a sample of 32 teachers at the fourth and fifth grade levels (125). These teachers were divided into high and low controlling groups on the basis of a previous study. The pupils were compared on creativity gain scores (Torrance task) corrected for initial differences in I. Q. The classrooms were observed through the use of revisions of the OScAR, and Flander's, and Ryan's observation schedules. Verbal statements were classified to separate the warm-permissive, and the cold-controlling teachers. Among other related findings, Wodtke found, at the fourth grade level, that pupils of teachers with little classroom controlling behavior achieved higher gains in verbal creativity than did pupils of teachers exhibiting much classroom control. The absence of significant relationships at the fifth grade level may have been due to the departmentalized organization found at this level, which caused the single teacher effect to be dissipated.

Soar has reported the results of a study of teacher-pupil interaction in which pupil gain in creativity was examined through factor analysis (108). Thirty-five classrooms in four elementary schools, grades 3 to 6, in a metropolitan area of South Carolina participated in the study. The Minnesota Tests of Creative Thinking were used to determine pupil creativity. Revisions of Flander's Interaction Analysis, OScAR, and Fowler's Hostility-Affection Scale were used to observe the classrooms.

Soar concluded that growth in creativity was fostered by indirect teaching in which the teacher supported the development of pupil ideas and it was hindered by high physical movement within the classroom and by the expression of negative pupil effect. It was also concluded that the interaction is so complex that no single aspect of behavior supports the achievement of a wide variety of educational goals. Many keys to effective teaching are needed.

A study by Gallagher used Guilford's structure of the intellect model in the study of junior and senior high school children to identify productive thought processes of the intellectually gifted children within the context of classroom verbal interaction and to assess relationships between these thought processes and certain variables that relate to their operation in the classroom (44). Data were collected by using tape scripts annotated by observers viewing the classroom interaction and noting the context in which the tape was made. The Ashner Gallagher Classification System, which categorized the statements into five major categories, was used. These five categories included are (a) routine, (b) cognitive-memory, (c) convergent thinking, (d) divergent thinking, and (e) evaluative thinking (44:11).

Gallagher found that a small percentage of divergent thinking requests by the teachers can stimulate a large percentage of pupil divergent response. Most of the teacher verbal requests are of the cognitive-memory, convergent thinking category. Only eight percent of the statements analyzed were of the divergent thinking category. He found that, although subject matter does seem to condition the preportion of the various types of thought processes used, teachers are still able to show their individual style within a given subject area.

Hilda Taba conducted a study in which the thinking of elementary school children was explored under the complexity of classroom conditions (112). Taba's study was based upon the assumption that how people think may depend largely on the kinds of thinking experiences they have had. The study included not only the observation of classroom interaction but also the development of a social studies curriculum and procedures which were designed to stimulate certain types of thinking. Teachers were trained for these purposes. Twenty teachers ranging from second to sixth grade were trained in the summer to participate in the study. Tapes of four hours of classroom discourse were obtained during the year from each of the 20 teachers' classrooms. These tapes were selected to illustrate the cognitive task of interest in the study. Samples were spaced throughout the year. Although creativity was not studied directly in this research, and other thinking processes were considered, her findings indicated that the most marked single influence on cognitive performance seemed to be the strategy the teacher employed. This included the nature of the questions the teacher asked. "The nature of the questions have a singular impact on the progression of thought in the class. The questions teachers ask set the limits within which students can operate and the expectations regarding the level of cognitive operations" (112:177).

Sears conducted a study in which 10 self-contained elementary classrooms were investigated (102). Seven of the classrooms were at the fifth and sixth grade level with 195 children, and three were at the first and second grade levels with 70 children included. The classrooms were tested with the Guilford tests once during this period for creativity. The classrooms were observed for motivational conditions and interpersonal, social, and transactional aspects rather than aspects of curriculum content, although these were recognized as operating. The observations were limited to the fifth and sixth grade classrooms. The observations were of the type in which the observer categorized behaviors while in the room.

Five full mornings were used for observation in the fall and in the spring. Both verbal and nonverbal activities within the classroom were analyzed. Sears found that high creativity scores correlated significantly with teachers who were observed to reward the child by reference to personal interest and personality attributes rather than by evaluation. Teachers in these situations tended to be concerned with the individual and listened to the child more than did teachers rewarding by evaluation. As opposed to this, low creativity scores were associated with the task-oriented work of a quiet, industrious classroom in which group methods and frequent evaluations were employed. Motivation in these classrooms seemed to be toward conventional work rather than new ideas or child-child affiliations.

Research on Teacher Behavior Analysis

If one were to inquire as to what professional education is all about, it would be most accurate to reply, "discovering what is effective teaching." The pursuit of this problem has followed myriad channels, yet has been very disappointing in results. One must agree with Wallen and Travers when they conclude that very few teaching patterns are derived from the scientific study of learning. Most are derived from tradition, the social background of the teacher, philosophical ideas, patterns gathered from the teacher's own psychological needs, and conditions in and demands of the school and community (119:452-53). It appears that education, as a discipline, is far removed from other, more scientific realms of study. Research in education that is concerned with more scientific specifications of teaching has ranged from general comparisons of method, such as "lecture versus discussion," comparison of "traditional and activity" procedures, "democratic and authoritarian" control, et cetera (119:468-80).

Teacher behavior analysis in context of explorations of methods of instruction and teacher effectiveness. Bruner has proposed the development of a "theory of instruction." This is seen as prescriptive and normative as contrasted to a descriptive theory, such as that of learning. However, a theory of instruction must concern itself with the process of how things are learned as related to how they are presented to the learner. It is a guide for what to do in order to achieve certain objectives (18). The empirical, systematic study of teaching and learning as approached through observational procedures is viewed as an important way to contribute to such a theory (119:493).

The time-sampling observation of teachers and learners in the natural classroom setting promises to make a major contribution to the discipline of teaching. It is the intersection of this line of research with the research on creativity which has significance for the design of future investigations. Since comprehensive reviews of the literature and research in the area of teacher effectiveness and observational studies are available (124;119;15;98) this will not be attempted here. An attempt will be made, however, to describe the theoretical foundations of behavioral studies and to relate the findings of some recent research which bears upon the design and development of instruments for observation and categorization of classroom behavior.

The development of observational procedures and their underlying rationale. The study of teaching is complicated by the great number of variables involved in determining pupil and teacher behavior. Drawing upon theory from the role-analysis research, sociology, and anthropology (11:1-37;46;100) teaching can be viewed as an interaction system influenced by the community and school and by forces within the classroom (15:11-18).

Within the classroom situation teacher behavior is varied by formative (i.e., preparation, socialization) experiences and personal properties (i.e., skills, needs). The behavior of the teacher in any given situation is further affected by the pupil's behavior in response to the teacher. The pupil behavior is also influenced by a complex system of variables (106). This system of interaction is further complicated by external goals imposed upon it and by the power wielded by the teacher as an authority figure (53:28-30;46:30-31;89:1).

Gordon classifies the goals which are of concern to teachers as: (a) learning achievement goals, (b) social-emotional adequacy, and (c) the goal of order--a system goal assumed to provide the conditions for attainment of the others (46). The teacher has the problem of integrating these goals and often finds inconsistencies and conflicts among them. They must also be harmonized with goals external to the classroom and school, and the goals of the pupils. Smith has presented the concept of "strategies" which the teacher employs to reach these goals (105).

Block has employed a similar model in her research (16). She describes each lesson as a sequence of action units. An action unit is interaction between teacher and pupils directed by a goal, a focus, and an operation. A goal is defined as an aim toward which learning is directed (concepts, skills, or attitudes). Focus is an idea, material, or belief on which the learner directs attention. An operation is the means by which pupils interact verbally with the focus to achieve goals (i.e., identifying, comparing, explaining, et cetera). The teacher closes an action unit by evaluating the pupil response as to its correctness or value. Major action units are a series of action units which may follow "progress tangents" (following positive evaluation of pupil response) or "corrective tangents" (following negative evaluation of pupil response).

Taba has also examined sequences of interaction and has presented a similar model (112). Thus, teaching is viewed as part of an interaction system in which many variables relate to and act upon each other. Many of these variables are not observable, these can be referred to as "intervening" variables. The observable variables are the behaviors of the teacher and the pupils.

The use of time-sampling observational procedures has been an attempt to objectively describe some of the behaviors in this classroom interaction system. It would appear that a carefully devised system of observation would eliminate many of the objections raised regarding studies of teacher effectiveness to date. These objections have included inadequate measuring devices, contamination by value judgments, and lack of attention to major variables in the teaching-learning process (22;65;124).

Ryans has laid the groundwork for the time-sampling observational procedures in his wedding of the sociological and social-psychological "system" concept to analysis of classroom interaction. His definitions and basic assumptions regarding teacher behavior may be summarized as follows:

1. Teacher behavior is the behavior of persons as they go about activities required of them in the direction of learning of others.
2. Teacher behavior is a function of certain environmental influences and characteristics of the teacher.
3. There is interaction between the various factors in a system (teacher characteristics, environment, pupils, et cetera) and within subsystems (between characteristics within an individual).
4. Teacher behavior is observable, is characterized by some uniformity, and the number of behaviors a given teacher is capable of are finite.
5. Different teacher behaviors or sets thereof can be distinguished from one another. They can be classified both quantitatively and qualitatively (97;95).

Based upon the assumptions and underlying rationale described above, interaction analysis, or time-sampling observational procedures, attempt to record interaction behavior in an objective manner. Value judgments by observers are minimized by establishing a common basis for observation and categorization of the behaviors observed to standardize, in effect, the process of inference. Training of the observers to gain speed and facility helps to improve objectivity and reliability. The feature of making inference differentiates this observation process from time and motion studies (11:6).

It has been found that error variance decreases as observers improve in ability to categorize using an observation instrument and as teachers and children become less aware of being observed (76). This implies the necessity for considerable training and a large number of visits. The observer may record the aspects of behavior as they occur. These recordings are typically in the form of tallies, check marks, or other marks which categorize the behavior (76:253). The categorization may be done in the actual classroom or with the use of tape scripts after they have occurred. A number of observation schedules require the "rating" of the behavior on "dimensions." The distinction between this and "categorization of behaviors" is not clear in the literature. Ratings are obviously not included in the meaning of time-sampling observation schedules when they do not refer specifically to behaviors (e.g., scores from 1 to 5 on a warmth dimension).

Medley and Mitzel, in a comprehensive discussion of observation schedule construction, described two types of item forms (76:250-253). A "category" system is one in which behavior dimensions are established and the observer need only tally each behavior into the proper dimensions. A "sign" system is one in which a number of specific acts or behaviors are listed and the observer checks them as they occur.

Some studies have dealt with only verbal behavior (106;39;52), while others have included non-verbal behaviors (97;70). Most of the studies using observational procedures have included both teacher and pupil behaviors. In such cases different observers have observed different aspects of the classroom interaction (i.e., one observes pupils while another observes teachers or only a few randomly chosen pupils) (6;7).

Methodology from research using observation schedules. A number of studies using time-sampling observation procedures have provided information regarding schedule construction, training and observation procedures, and dimensions of teacher-pupil behavior.

Three problems are characteristic of all the reports of initial observation schedule development: (a) qualification of behavior and definition of categories; (b) observer training and achievement of reliability; and (c) the finding of an appropriate statistical model for analysis (86). Most studies indicate that increasing the number of visits to the classroom increases the reliability of the evaluation (120;123). Since observational studies are expensive, the procedure of estimating reliability of a number of visits proposed by Medley and Mitzel is valuable (71).

Reliability of the schedule is often estimated by using percentage of agreement between two independent observers or by comparing scores for a given teacher over several visits (123;118;44). Differentiation by the researchers between objectivity of the schedule (the degree to which it is an accurate measure) and reliability (the consistency of measurement) are not clearly made in some studies (118;44). It is also difficult to utilize the concept of reliability as "consistency of repeated measurements," when change in behavior due to some experimental factors, training, et cetera, is postulated. Reports of coefficients of observer agreement ("reliability") must further be interpreted in terms of the system employed. In those studies in which tape scripts are used and can be examined at length before categorization, it is obviously easier for the observer to arrive at an accurate categorization than it is in the live classroom situation. In addition, in at least one study, teams of judges were allowed to discuss statements and then categorize. The "reliability" coefficient reported was between independent teams (44). Such discussion also helped agreement.

Medley and Mitzel have proposed a distinction between the term "reliability coefficient" (the correlation to be expected between scores based on observations made by different observers at the same time), and stability coefficient (correlations based on observations made by the same observer at different times)(73:253-54). The coefficient of observer agreement would be an indication of objectivity of the schedule, the coefficient of stability indicates how accurate the measurement is of true behavior.

These researchers have further preposed the use of analysis of variance procedures to obtain an estimate of these coefficients. It is viewed as yielding a better estimate of reliability than correlation which is biased and has a larger sampling of error. Correlation can only compare two sets of measurements at a time where analysis of variance considers all components of variance. It also yields a test of significance (71). Cornell has also reported this procedure (25).

Validity of the schedule is estimated by comparison of the scores with other schedules (124); with criterion variables (pupil behavior or achievement); with aspects known or postulated to be related (teacher personality characteristics); or with theoretical constructs (28). A number of studies have reported problems occurring in prediction of criterion variables due to ambiguous items or dimensions (118) or to failure to consider the context of the behavior or verbal statement (38:43-44;10:63). Obviously, a smile or a "good" will have one effect when it is given in response to a pupil's correct answer and another effect when in response to a divergent answer.

In some cases teacher behavior has been assessed in natural situations according to a priori dimensions developed according to some theory of instruction and learning (37;6;7;23). In some other cases teachers' natural behavior has been investigated without a priori dimensions in an attempt to identify significant dimensions (58;97;106). Some studies have used factor analysis to relate teacher behaviors.

In spite of differences in the age of students, the content areas observed, and the method of recording behavior which makes comparison difficult, it would appear that two types of factors operate in most studies. One is related to the teacher's personal relationship with the students, the emotional-social aspect. The other is related to the content of instruction and the learning task (98;70;58;102;118). A problem arises because these dimensions are so variable in relation to pupil learning and other student effects (criterion variables). It has been suggested that, although these dimensions may prove to be related to learning in subsequent studies, they may need to be revised and broken down. Because of their generalness they may be ineffective predictors. Upon further analysis it may be found that the manner and quality in which they are manifested may be better predictors (110). The interaction of teacher and pupil behaviors in the context of the demands of different content areas may also necessitate the consideration of combining dimensions into profiles (100:255;15:1-40;58).

Summary

As students of education have considered the teaching act in an attempt to accurately describe and control it in order to more effectively achieve the goals of society, two lines of research have developed. The intersection of these two lines of research holds promise for the achievement of the goal of pupil creativity development. One line of research has exposed aspects of the intellect which appear to be different from the aspects measured by standard intelligence tests. Since these aspects correlate positively, they appear to be related and are described as "creativity." This line of research also implies "creativity" can be developed through direct training in adults and in children. Examination of the indirect fostering of pupil creativity has been less conclusive. The features of teacher personality and classroom conditions which foster creative development have not been clearly defined; that the role of the teacher is an important variable, however, is clear.

The second line of research has been the development of the time-sampling observation technique of studying teaching and learning in its natural setting. Research has demonstrated the reliability and objectivity of such procedures and offers many suggestions for the training of observers and the development of observation schedules. The major problem of this research, however, has been to combine items into categories of behavior analysis which will meaningfully predict pupil performance. It appears that the relationship of teacher and pupil variables in the classroom interaction system is very complex, and there is no simple, one-to-one association with creative variables.

In pursuit of the goal of discovering how to teach to develop the child's creative potential, it would seem the direct study of classroom behavior variables would be most profitable. Studies of teacher personality and attention to specific training procedures have not been fruitful over an extended period, such as in the everyday classroom situation. The study of teacher-pupil behaviors which relate to pupil creative growth is seen, then, as a step in a series of steps leading to this goal as follows:

Step I. Identification of Creativity

A. Theory development

B. Test development

Step II. General Teaching Procedures to Encourage Creativity Development

Step III. Detailed Analysis of Teacher-Classroom Variables Which Facilitate Pupil Creative Growth

A. Development of An Observation Schedule

B. Examination of Variables in a Variety of Classrooms and with a Variety of Criterion Measures

Step IV. Instruction of Teachers in an Attempt to Alter Classroom Behavior for Creative Development of Pupils

Review of the literature relating to the development of observation schedules suggests the need to design the schedule and its system for categorization of behaviors in terms of the specific criterion variables of interest. Broad categories identifying the more general teacher-pupil behaviors have not been shown to relate to learning consistently or clearly. This may well be due to the complexity of the teacher-pupil interaction system. Suggestions for the design of categories of classroom behavior can be generated from a study of the psychological literature related to creativity development and the creative personality, and from empirical studies of pupil creative development. An observation schedule consisting of categories so derived must then be validated in actual classroom situations. Should the teacher variables (independent variables) included in the schedule prove to be valid predictors of pupil creative development (dependent variables), an important step will have been taken toward preparation of teachers to achieve the goal of pupil creative development.

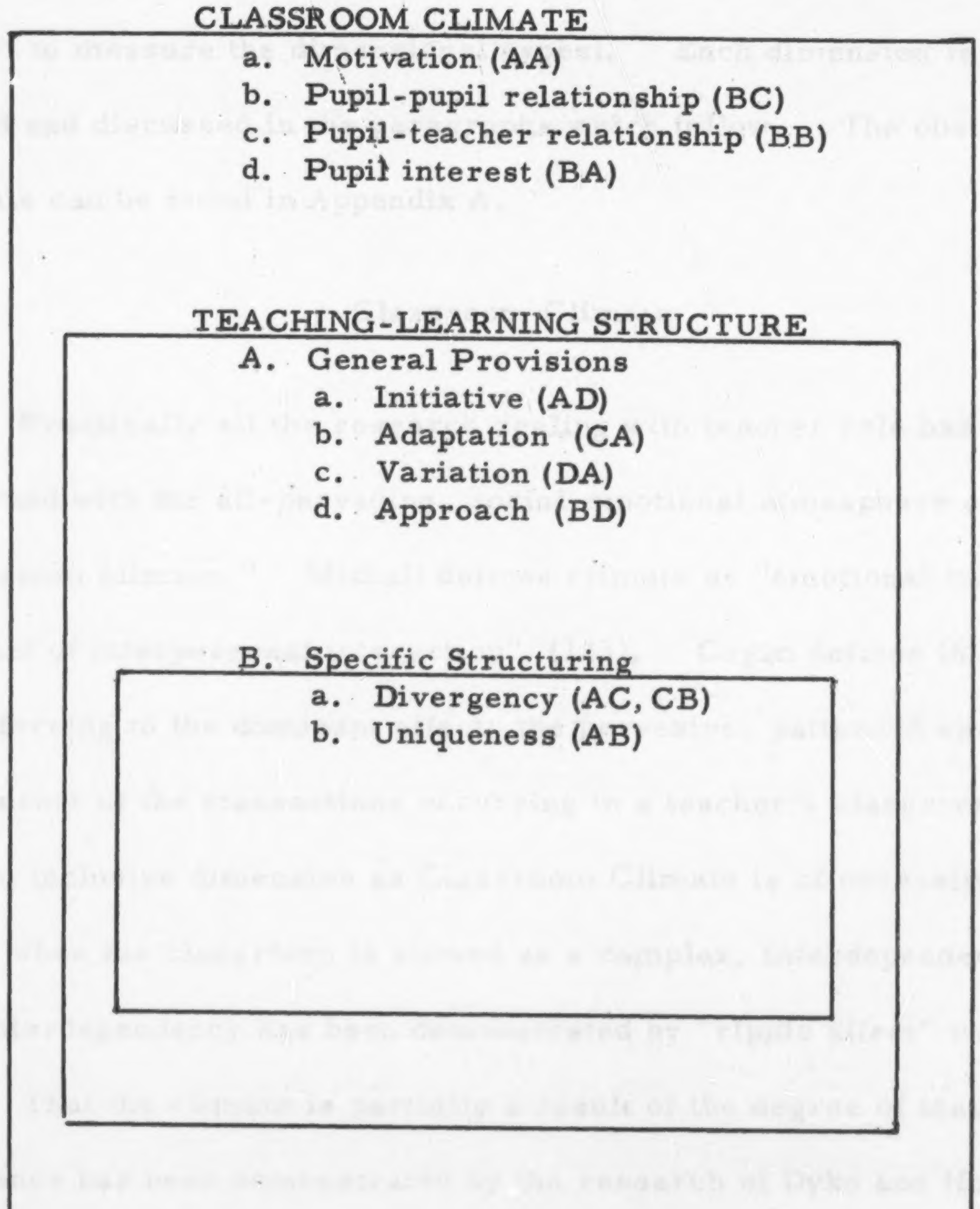
CHAPTER III

THE OBSERVATION SCHEDULE - UNDERLYING THEORY AND RATIONALE

Hypothesized Dimensions of Classroom Interaction

The dimensions of classroom interaction described below are hypothesized as a result of investigation on the part of the experimenter and his colleagues in a previous study (94) and are further supported by theories and research in creativity and psychology.

Two major areas are hypothesized. Each has a number of dimensions which combine to form the major area. The areas and dimensions are outlined in Figure 1. It will be noted that Classroom Climate and Teaching-Learning Structure are the two major areas. Classroom Climate includes the dimensions Motivation, Pupil-Pupil Relationship, Pupil-Teacher Relationship and Pupil Interest. Teaching-Learning Structure is subdivided into two categories, General Provisions for structuring the learning situation and Specific Structuring for creative development. General Structuring includes the dimensions of Initiative, Adaptation, Variation, and Approach. Specific Structuring is composed of Divergency and Uniqueness dimensions. It will be further noted that the climate area encloses the structure area indicating Classroom Climate is a necessary prerequisite for structuring to be effective in pupil creative development. In like manner, General Provisions for teaching-learning



CLASSROOM CLIMATE

a. Motivation (AA)
b. Pupil-pupil relationship (BC)
c. Pupil-teacher relationship (BB)
d. Pupil interest (BA)

TEACHING-LEARNING STRUCTURE

A. General Provisions
  a. Initiative (AD)
  b. Adaptation (CA)
  c. Variation (DA)
  d. Approach (BD)

B. Specific Structuring
  a. Divergency (AC, CB)
  b. Uniqueness (AB)

Figure 1. **Hypothesized Dimensions of Classroom Interaction**

structure are necessary for Specific Structuring to be effective. Code letters in Figure 1 refer to the items of the observation schedule which purport to measure the dimensional aspect. Each dimension is briefly defined and discussed in the paragraphs which follow. The observation schedule can be found in Appendix A.

Classroom Climate

Practically all the research dealing with teacher role has been concerned with the all-pervading, social-emotional atmosphere called "classroom climate." Withall defines climate as "emotional tone concomitant of interpersonal interaction" (123). Cogan defines this term as "referring to the dominant effect, the pervasive, patterned emotional components of the transactions occurring in a teacher's classroom" (24). Such an inclusive dimension as Classroom Climate is of necessity included when the classroom is viewed as a complex, interdependent system. Such interdependency has been demonstrated by "ripple effect" research (64). That the climate is partially a result of the degree of teacher dominance has been demonstrated by the research of Dyke and Hughes (15:176-178).

In the literature and research dealing with creativity development the classroom climate takes on a position of prominence. Creativity is viewed as a function of personality which is "open" to experience (25;40;51). Anderson views creativity as spontaneous behavior which is only exhibited when the environment facilitates creativity--when environment reduces defensive distortions in the individual's perceptions (4). Such an harmonious environment reduces threat. The individual is accepted as he is and he is stimulated through the interweaving of spontaneities--the free interplay of differences. Rogers points out that psychological safety and freedom must be provided. The individual must be accepted as of unconditional worth, external evaluation must be removed, empathic understanding must be present (91). Torrance has found peers exert pressure on the individual to conform. This is in addition to pressure by teachers and parents (115:121).

Motivation. As a sub-category of the Classroom Climate area the means of teacher motivation of the class is considered vital, since it structures the degree of psychological freedom as well as provides for the intellectual stimulation and challenge needed for creativeness. The negatively motivating teacher will threaten the child and fail to challenge (92). The positively motivating teacher will challenge the child while simultaneously making him feel safe and secure to act (50). The Motivational Climate has been described as a continuum ranging from a continuous negative motivation to a continuous positive motivation. Item AA, Motivational Climate, defines this aspect. It refers to the manner in which the teacher motivates the class. Such motivation ranges from a negative, threatening type of motivation which would be a low score, to a positive, self-motivating or stimulation through curiosity which would be a high score. It is hypothesized that creativity is developed when the teacher employs more positive than negative motivational behaviors.

Pupil interest. Other aspects of the classroom climate are assessed by observing the teacher-pupil and pupil-pupil relationship. In the classroom in which creativity is developed the children are challenged and interested. The teacher's personality is contagious. It is hypothesized that creativity is developed when the teacher has built a relationship in which children are responsive and interested. The pupil behaviors described in Item BA, Pupil-Teacher Relationship, reflects such a situation. This item refers to the behaviors of pupils in relation to the teacher behavior. It consists of a positive-negative dichotomy in which contrasts such as "eager response in recitation" and "worked intently" are contrasted with their opposites. This item is an adaptation of one developed by Cornell, Linduall and Saupe (25).

Pupil-teacher relationship. Along with the motivational climate there must be a mutual respect of teacher and pupil. The teacher must view the child as a unique individual of worth. It is hypothesized that a positive relationship in which the teacher respects the contributions of pupils is necessary for creative development. Item BB, Teacher-Pupil, reflects such a climate. This item refers to the manner in which the teacher responds to pupils. Behaviors such as "teacher responded positively to contribution" and "teacher used 'We' approach" are contrasted with their opposites.

Pupil-pupil relationship. Since peer pressures to conform are as strong or more so than those of the teacher, the pupils must have a peer relationship in which individuality is valued. It is hypothesized that creativity is developed in the classroom in which pupils refer positively to peer individuality. Item BC, Pupil-Pupil, identifies such a situation. Pupil-Pupil refers to dichotomized situations in which positive behaviors such as "children refer positively to success of others" and "children share responsibility" are contrasted with negative opposites.

Teaching-Learning Structure

The teaching-learning structure refers to the organization of the teaching-learning situation. Various studies of teacher role have utilized analysis of teacher behavior patterns and styles as they relate to pupil response (18;75;72). Especially pertinent here is the concept of "reinforcement" of pupil behavior directly by the teacher and by teacher controlled situational variables (118:492). For example, Hughes (15:179) and Flanders (15:202-206) found that the direct behavior and verbal statements of the teacher influence the freedom of pupil response, achievement and attitude formation. In like manner, Biddle and Ellena report studies by Kowatrakul and Gump which indicate the kind of activity and the materials used affect pupil learning. Kowatrakul found that variations in environments resulted in changes in pupil behaviors (15:189). Gump has indicated that the learning situation "format" which provides for extended pupil initiative may result in high creativity as the pupil is left to fill in the gaps (15:193).

Cornell and others (25) developed an observation schedule for use in this study. The number of varieties of activity provided in the learning environment induce or support different pupil perceptions and behaviors. Lack of variety may contribute to pupil apathy (15:188-190). Activity variation has been found to result in more widely discrepant student response than does subject-matter variation (15:189). Gump also reports research that indicates that activity settings coerce behavior (15:174). This relates directly to the findings of Torrance, which indicate the school setting squelches creativity (115:104-124).

The research and literature in creativity suggests that the teacher who develops creativity is one who purposely plans and structures the teaching-learning situation to facilitate creativeness. Thus, although the teacher may incidentally have a classroom climate which encourages creative response, the teacher must also deliberately encourage creativeness. Anderson contrasts the open or divergent system in which uniqueness in perception and thinking are stimulated with the closed or convergent system in which originality and invention are discouraged and the student is mainly concerned with acquiring a body of knowledge (5). Rogers points out changes needed in our evaluative system in order to consider creative ideas as well as factual learning (91). Yamamoto's study, which found children's "why" questions drop off at the fourth grade level (127), has implications for teaching-learning structuring when compared to Torrance's findings of a drop in creativity at this same level (115:104-124). Premature structuring is blamed as a deterrent to creativity development (14).

In addition to direct teacher encouragement of divergent thinking, the teacher must also stimulate student awareness and expand his experiential basis for creative production (14). Andrews refers to the use of a variety of media and materials of instruction coupled with an astute teacher awareness of individual pupil readiness in utilization of time and in pacing instruction (9). Rogers (91) and Barken (12) also refer to the need for individual readiness and the need for children to have meaningful experiences. In another source this type of multi-media, meaningful approach to learning is called broad or loosely structured content:

> They [the teachers] open subject matter for children (as opposed to covering it) and encourage thinking beyond the facts as they use projective approaches, unsolved problems, and open-ended questions. (26:158)

Murphy supports the need for a variety of experiences in his study of Tennessee hill children who lacked the stimulation of environment as compared to the rich experiences of children with master craftsmen in such places as Brittany, Bali, and India (78:132). The classroom environment must provide mechanical factors of space, time, and equipment to facilitate the variety of experiences children need (26).

The area of teching-learning structure has been included in the belief that the teacher must deliberately structure for creativity development in addition to providing a conducive climate. The area of teaching-learning structure can be further subdivided into two categories, general provision for creative development in all activities and specific structuring to encourage creativeness.

The teacher controls the type of pupil response by structuring the learning situation. The types of questions asked, materials and activities employed, the amount of pupil initiative allowed, the types of reward provided all serve to provide general structure. Such structuring is found in all instruction and is different than specific structuring designed to elicit specific pupil response.

Initiative. In light of the research reviewed above, it is hypothesized that the teacher encourages creativity by providing for a high degree of pupil initiative. Such an environment will allow individual responsibility and will challenge children to respond creatively to open-ended situations resulting from less teacher control. Item AD, Initiative, is an adaptation of the Cornell schedule (25) and describes learning situations ranging from teacher domination to pupil control.

Adaptation to individual differences. Whenever the teacher fails to differentiate instruction to care for individual differences he ignores readiness and runs the risk of lack of individual challenge, thus exerting pressures on individuals to conform to the group or teacher goals. It is hypothesized that the teacher who develops creativity differentiates for individuals in the class. Item CA provides a record of the number of different individuals with whom the teacher spends time as compared to the total number of times he differentiates. Ideally the teacher would differentiate for all or almost all of the children in the classroom.

Variation. Since a variety of activities and materials of instruction should serve to challenge and stimulate children, Item DA provides for a tally of the different kinds of activities and/or materials being used. It is hypothesized that the teacher who uses the greater variety of materials and/or activities fosters a greater degree of creativity development.

Approach. Teacher approach refers to the manner in which the teacher responds to pupil reactions in the introduction and pacing of instruction. This refers to the way the teacher responds to questions and comments to alter the direction and flow of the lesson, to the ready use of materials of instruction, and to the involvement of children at high points of interest as the lesson proceeds. Teacher approach is meant to refer not only to the introduction and conclusion of lessons but also to teacher behavior as the lesson moves from section to section or phase to phase. It is hypothesized that the teacher who is developing pupil creativity must be responsive to children in the instructional procedure. This involves pupil readiness to learn and allows pupils to interject questions and comments according to their learning needs.

It may be that the reason the training studies previously referred to in Chapter II were only partially effective was that they were not included in the context of a proper classroom climate and general structure. It is hypothesized that, where climate and general structure are operating, specific structuring to develop creativity deliberately will be most effective. In "specific structuring" the teacher is consciously concerned with structuring lessons to encourage development of pupil creativity. This may be done in special lessons or it may be a deliberate part of the usual lesson.

Divergent thinking. Turning to the behaviors of teachers which are deliberately designed to develop creativity, one finds teacher behaviors which reinforce divergent as opposed to convergent thinking. This may be a part of lessons designed for convergent thinking, or it may be a lesson solely designed to develop divergency. It is hypothesized that the teacher who develops creativity encourages divergency to a significant degree. Schedules AC and CB gather data regarding teacher behaviors related to this dimension. AC, Teacher Role in Encouraging Convergent and Divergent Thinking, refers to teacher encouragement of divergency through questions asked or activities conducted as opposed to encouragement of convergency and suppression of divergency. CB, Teacher Encouragement of Unusual Response, consists of a score obtained by tallying the number of times the teacher encourages pupil unusual response by direct or indirect reward.

Uniqueness. In connection with variation in amount of activities and/or use of materials of instruction described previously, it is hypothesized that the use of unique materials and/or activities of instruction will serve to develop creativity to a greater degree than the use of the same amount of standard activities and/or materials of instruction. Such a unique use of materials and activities should serve, it is reasoned, to provide a greater challenge and stimulus to creativity development than the standard use. The unique use will help the child express his creative ideas in new ways and with greater depth; it will help him to experience presentations by others and by the teacher in a like manner. Sensitivity and originality will be better provided for by using unique materials or combinations of materials. Item AB, Variation in Amount of Uniqueness, refers to highly standard use of materials and/or activities of instruction compared to highly unique use.

Summary

An attempt has been made in this chapter to present the dimensions and items which compose the Denny, Rusch, Ives Classroom Observation Schedule and to explain the theory which supports them and which contributed to their inclusion. The schedule is constructed to identify classrooms in which teacher-pupil behaviors are congruent with theory from psychology and with the findings of past research in this field regarding conditions favorable to pupil creativity development. Two major areas, Classroom Climate and Teacher-Learning Structure, are hypothesized. Classroom Climate is viewed as a prerequistie of Teacher-Learning Structure.

Specific Structuring to encourage creativity development is included within General Structuring. These areas are thus seen as being interrelated.

CHAPTER IV

PROCEDURES AND RESEARCH DESIGN

This study is concerned with a preliminary analysis of the Denny, Rusch, Ives Classroom Observation Schedule designed to identify the complex of teacher and pupil behaviors which contribute to pupil gain in creativity. The procedures used to estimate the schedule's reliability, objectivity, and validity, the sample of classrooms used in this study, and the statistical design employed will be described in the pages to follow.

Description of the Sample of Classrooms Used in the Study

Thirty sixth grade classrooms in the central portion of a Midwestern state were selected for the purpose of this study. Although they may not be typical of sixth grade classrooms in general, they may be typical of the sixth grade classrooms in this geographic area. In most cases, the teachers of these classes were not volunteers. The procedure followed by the investigator was to contact chief school administrators of area school systems and ask their cooperation in the study. In only one case did an administrator request approval from the teacher involved. In two cases the elementary principals were consulted prior to the chief school administrators committing the school system to cooperate in the program. In the one remaining case the decision was made by the chief school administrator alone.

In spite of not having volunteers, a good rapport seemed to have developed by the time the pre-testing was completed. This may have resulted from the fact that the investigator personally administered the pre-tests and at this time took pains to inform the teachers of the importance of the study. The teachers were not directly told that their teaching and behaviors would be the primary focus of the study. They were told that the purpose of the study was to analyze the observation schedule, and that this would involve the comparison of observation scores made, using the schedule, with pupil gain in creativity from pre-tests to post-tests. Another factor contributing to the successful working relationship was the pupil enjoyment of the creativity tests and the rapport developed with the pupils. The importance of the study was explained to the pupils, and they seemed to take pride in participating in it.

By working with all the sixth grade teachers in the cooperating school systems the possibility of a biased sample of teachers was diminished. Such a biased sample might have resulted if the teachers had had opportunity to volunteer for inclusion in the study.

Further description of the sample of teachers and classrooms utilized in this preliminary analysis of the observation schedule is provided in Tables 1 and 2. It will be observed that most of the teachers held the B. S. degree having obtained it from 1950 to 1959. Most of the teachers had recently (within the year) participated in course work. Total years teaching experience averaged 11. 75 years. Average experience at the sixth grade level was 7. 33 years. Pupil mean I. Q. ranged from 92. 58 to 117. 52. Mean socioeconomic ratings ranged from 3. 67 to 5. 57.

TABLE 1. PREPARATION OF TEACHERS PARTICIPATING IN THE INVESTIGATION*

Degree Held		Year Obtained		Recency of Courses Taken	
B. S.	18	1965	5	Currently Enrolled	4
M. S.	6	1964	4	Last Summer	2
M. A.	5	1963	2	A Year Ago	13
B. A.	1	1960	3	Two Years Ago	5
		1955-59	6	Three Years Ago	6
		1950-54	6		
		1939-49	3		
		No date given	1		

*The numerals refer to the number of teachers to which the items pertain.

The 30 classrooms were located in four school systems. Thirteen classrooms were located in a newly consolidated county-wide school system. Six of these were located in elementary buildings within a municipality and the remaining seven were located in schools which had been recently consolidated. These were typically single buildings housing kindergarten through twelfth grade. Usually there was only one class at each grade level. In all of these cases the buildings were old, sometimes crowded, but usually well kept and supplied.

TABLE 2. SUMMARY OF CLASS MEANS AND STANDARD DEVIATIONS FOR I. Q. AND SOCIOECONOMIC RATINGS*

Class	I. Q.	S. D.	Socio-econ.	S. D.
1	92.58 (34)	12.08	5.31 (35)	1.27
2	103.22 (27)	9.34	4.57 (26)	1.70
3	105.68 (25)	11.50	5.28 (25)	1.13
4	97.69 (26)	10.82	5.24 (25)	1.69
5	103.60 (28)	13.55	5.29 (27)	1.35
6	109.27 (29)	14.73	3.67 (31)	1.75
7	107.41 (31)	13.38	4.31 (32)	1.82
8	109.37 (27)	15.90	5.46 (30)	1.13
9#	109.83 (12)	11.51	5.33 (12)	1.55
10	107.86 (30)	15.06	4.57 (33)	1.71
11	102.14 (28)	17.53	4.10 (30)	1.78
12	103.69 (26)	16.21	4.70 (27)	1.48
13	106.55 (29)	13.30	4.82 (34)	1.35
14	106.43 (32)	16.79	4.50 (32)	1.48
15	102.68 (32)	17.71	4.93 (33)	1.41
16	114.68 (35)	13.25	3.97 (35)	1.50
17	105.46 (26)	11.97	4.00 (31)	1.67
18	100.76 (26)	13.88	4.67 (28)	1.36
19	101.72 (22)	14.62	5.17 (28)	1.27
20	101.34 (26)	9.56	5.53 (28)	1.17
21#	115.26 (15)	5.92	4.40 (15)	1.84
22	94.87 (40)	13.39	5.37 (40)	1.16
23	107.52 (25)	15.13	4.69 (26)	1.31
24	99.11 (26)	9.37	4.51 (33)	1.48
25	115.81 (38)	17.33	4.54 (37)	1.38
26	115.30 (33)	13.94	4.08 (36)	1.66
27	113.06 (30)	12.13	4.39 (33)	1.81
28	117.52 (34)	12.52	3.90 (32)	1.72
29	92.95 (20)	11.38	5.33 (24)	1.23
30	99.14 (34)	11.67	5.28 (38)	1.18

*The number in parenthesis indicates sample size. Variation is due to absences during time of testing.

#Fifth-sixth grade combination in which only sixth grade pupil's scores are reported.

Another school system, similar to the first in that it was a county-wide consolidation, contributed 10 more sixth grade classrooms to the sample. In this case seven of the 10 classrooms were located within the municipality, and the remaining three were located in rural buildings. In none of these cases were the separate buildings a K through 12 school. All of the buildings had been remodeled to house only elementary grades. The facilities in this school system appeared to be more adequate than in the school system previously described. The classes were not as large, and the buildings and instructional equipment were of a more modern design. This school system evidently had a stronger financial base and had been consolidated a longer period of time than the one previously described. Two classrooms were located in a third school system and were in the same elementary building in a city. The five remaining classrooms were located in a fourth school system with four of the classrooms in a new, modern elementary building. The remaining classroom was located in a much older elementary building in a socially deprived suburban community.

The Instruments Used to Collect Criterion Data

Development. A battery of tests, developed from those of J. P. Guilford, was prepared for use in this study. The battery had been developed in a previous pilot study conducted by the investigator and his associates during the 1964-1965 year in New York State. The problems of administering the tests were worked out during that time. In a number of cases, changes in wording of the tests had to be made to make them understandable for sixth grade children, as many of these tests had been originally developed for use with adults. Because of copyright limitations it is not possible to include a copy of the test battery. A more detailed description of the aspects of creativity measured by these tests as well as the publication source is provided in Appendix B.

Administration. The investigator administered all of the pre-tests and post-tests. Use of a single, trained person to administer the tests was believed to be especially important when using a test battery of this type, in which the attitude and motivation of the pupil is influential. By having one person administer all of the tests, consistency was obtained. The pupils were briefly enlightened as to the purpose of the tests and the study. They were told that the tests would be different from their usual classroom tests and that they would find them fun and something for which they would not need to prepare. They were further cautioned to do their best and were encouraged to employ their original ideas and not to be concerned with handwriting, correct spelling, or proper sentence structure. Every effort was made to build a positive rapport with the class prior to the administration of the tests. There were many evidences that such a rapport was established.

The pre-test was administered in October, the post-test in April. One hour was required for administration of the battery, including the giving of directions.

Alternate forms of the test battery were not available. Since approximately six months intervened between the pre-testing and post-testing, the use of the same form for the post-tests was not considered to be detrimental. There were no evidences of pupil recall of items. The teachers were allowed to remain in the room during the pre-testing and to examine a copy of the test, however a copy was not left with them and they were cautioned not to discuss the test with the children.

Scoring. The tests were scored by four research assistants who had received training for this purpose. This was necessary since only the Gestalt Transformation test was of an objective type. The remaining tests required the student to write out a response which required some judgment on the part of the scorer. Although, in order to establish reliability coefficients, two persons were trained and compared in their scoring for a given test in the battery, in most cases only one person scored a given test for all classrooms for both pre-testing and post-testing. This was done to provide consistency in scoring. The scoring procedures are summarized in Appendix B. Those provided by the publisher and by Dr. Guilford were used and revised where necessary.

Reliability. To ascertain the reliability of the test data a number of analyses were made. These analyses were made on samples of the test data drawn at random from the pre-test and post-test scores. To determine the objectivity with which the essay-type, open-ended items were being scored, correlations were run between scorers for each subtest in the battery.

Split-half reliability coefficients were computed for each sub-test using the Spearman-Brown formula.

Validity was estimated by the correlation of each subtest with a peer nomination, "Who Does It?", and interest and activity inventory, "Things Done on Your Own," designed for this purpose. These devices are contained in Appendix D.

The Observation Procedures

A team of three observers was used, one of whom was the investigator. The other two were graduates with bachelor's degrees. One of the observers had had extensive elementary teaching experience; the other had taught high school home economics for three years. The observers were selected in terms of interest in the project and were highly motivated throughout. No attempt was made to base selection of the observers upon any particular criteria, since the training period was utilized to develop observer competency.

Training of observers. Closed circuit television facilities of the Indiana University Laboratory School were utilized during the observer training phase of the project. Training entailed some 30 hours, of which 16 were spent with the University School television facilities. The remaining hours of the training period were spent in live observation at the

University School (a total of approximately 90 minutes) and in related discussion of the schedule and observation procedures. Observer training took place February 7 to 18, 1966.

The television facilities were uniquely suited to the purpose of the training, which was to give the observers an opportunity to use the observation schedule on actual classroom situations in order to increase inter-observer agreement. The unique feature which made the television facility more valuable than live observation was the use of television recordings. By recording each observation the observers could see the identical situation a second time and could compare their scores with their initial observation. A second advantage of the television facility was that the observers could discuss the on-going situation in reference to the schedule they were using as it was in operation. This would not have been possible if they had been sitting in the actual classroom. It was also possible, by taping, to pre-select a variety of situations occurring at different times of day but to schedule the training sessions at the same time each day.

In the initial introductory session the observers were told about the project, its goals, and the procedures that would be followed. The observation schedule was then discussed in general with consideration given to the questions of the observers regarding the meaning of terms, format, et cetera. In the second session more detailed discussion of the schedule was carried out employing the questions of the observers from their study of the schedule. The following five sessions utilized the T. V. facility and consisted of (a) an initial viewing of a 30-minute situation, (b) analysis and comparison of the observation scores assigned independently by each observer to clarify disagreements, meaning of dimensions, et cetera, (c) a second viewing of the situation, using a video tape, and (d) a concluding discussion and comparison of scores obtained upon the second viewing with those of the first. The last three sessions of the training period were 30 minute observations in an intermediate grade classroom of the University School. In these sessions the observers entered the classroom, sat down in different parts of the classroom and independently observed the on-going pupil-teacher activities. The observers later compared their observation scores and discussed areas of disagreement. The purpose of these last three sessions was to give the observers an opportunity to experience the live situation prior to entering the 30 classrooms selected for the study.

Scheduling of visits. An effort was made to obtain a random sample of the teacher-pupil behaviors in the 30 classrooms. The procedure followed was to obtain, from the teacher, a schedule of each classroom on which was indicated recess time, lunch time, and times in which special teachers would be working with the pupils. Although only self-contained classrooms were used in the study in all cases the children met with a music, art, and in some cases physical education teacher at least once a week. The classrooms were numbered from 1 to 30 and the visits were scheduled by drawing a number at random for a particular day. The order in which the numbers were drawn was the order in which the visits were made to the classrooms as far as the time of day was concerned, with the possible exception of changes necessitated by the class schedule for that day. It was not possible to make this a completely random order of visits, however, since transportation between schools located in separate systems during the same day would have been impossible. Therefore, the first number drawn determined the school system which would be visited during a particular day. Subsequent numbers drawn for classrooms not in that school system were set aside and these schools were not drawn for that day.

The teachers were not notified of the visits in advance. They were simply told that they would be visited three times during the months of February and March, 1966. They were requested to ignore the three observers, not to meet them at the door but simply to let them slip in and sit down, and to go about their normal classroom activities, and the observers would simply leave when they were finished with their observation. They were further instructed to inform the class they would be visited three times but not to pay attention to the observers and to continue with their activities. It was emphasized for both teachers and children that the observers wished to see the way the class worked together each day. By not scheduling the observatons in advance it was believed that a more typical sample of behavior would be obtained. There was no evidence that this was not so. In only a few cases, and usually only on the initial visit, was there any indication of the teacher or pupils feeling ill at ease or responding in any overt way to the presence of the observers in the classroom. In subsequent inquiry, after the observations were completed, no teacher indicated that he believed the behavior of the class was abnormal or that he himself behaved in a way different from the usual. The teachers were not aware of what aspects of the classroom were being observed. At no time did they see the observation schedule directions. If they accidentally saw the schedule score sheet, it did not provide them with any clues as to what the scores and tallies represented. An analysis of the schedule of visits for repetition of days of the week and time of the day when the visits took place indicated that random selection produced an optimal spacing of visits. The average number of days intervening between visits was ten days ranging from 3 to 31 days. Very few days of the week or times of day were repeated for a given classroom. The average number of repititions was less than one time and ranged from 0 to 2 repititions. Tables 3 and 4 indicate the type of activities most frequently observed and the type of content most frequently taught during the visits. Most frequently observed was reading, mathematics, language arts (English), and social studies content. The activities used in these content areas were most commonly use of the textbook at the seat, oral quiz, teacher lecture and use of the blackboard. The information provided in these two tables also provides the reader with some further indication of the type of classrooms in the sample.

TABLE 3. TEN MOST FREQUENT ACTIVITIES OBSERVED

Activity	Times observed
Textbook at seat	70
Oral quiz	65
Teacher lecture	61
Blackboard	54
Discussion	37
Correct papers	36
Read aloud	33
Other books	31
Charts, maps	20
Workbooks	18

Visit Procedures. Upon entering the building the three observers entered the classroom without knocking and moved quietly to the sides and rear of the room. Chairs were made available in each classroom or were carried in by the observers so that they could be seated unobtrusively rather than have to stand in the classroom. Just prior to entering the classroom, while watches were being synchronized, the observers would agree on the first five-minute interval in which to begin scoring. Five minutes was usually allowed without scoring, so that the observers could orient themselves to the classroom and the teacher and pupils could become accustomed to the observers. At no time was there communication between the observers regarding the scoring of the teacher-pupil behaviors. Each record was made by each observer independently of the others. Although in some cases the observation was discussed after it had taken place for the purpose of additional training, the observers were not

TABLE 4. TYPE OF CONTENT OBSERVED

Type of content	Times observed
Reading	19
Mathematics	19
Language arts: English	13
Social studies	10
Spelling	9
Science	7
Current events	7
History	6
Health	3
Weekly reader	3
Geography	2
Library	2
Oral reports	2
Map skills	2
Creative writing	2
Literature appreciation	2
Handwriting	2
Speech	1
Biography	1
Drama	1
Debate	1
Art	1

allowed to make any changes in the scores which they had assigned. The scored observation schedules were collected by the investigator at the end of each day. They were then filed and could not be consulted by the observers again prior to the next visit to that classroom.

The direction manual and scoring sheet for the Denny, Rusch, Ives Observation Schedule is included in Appendix A. These were the directions utilized by the observers in this study.

Design of the Statistical Analysis

The dependent variable in this study is pupil creativity test data. The independent variable is the score obtained from the observation of each classroom. An indication of the validity of the schedule can be obtained by comparing the independent and dependent variables, and the reliability and objectivity of the observation schedule can be determined by analyzing the independent variable. The mean creativity post-test score of each class group was used for comparison with the mean observation score for a given classroom given by all observers over all visits. The mean creativity post-test score for each class group was adjusted by analysis of co-variance and error regression for initial differences in pre-test creativity scores, measured intelligence, and socioeconomic status.

Socioeconomic status was determined by examining parent occupations, using the Warner scale (121). From the Warner scale a value from 1 to 7 can be assigned which identifies status.

The intelligence test scores used in the analysis of co-variance were obtained from the school records. These tests had been administered from two years to two months prior to the time of the post-testing. Three intelligence tests were used in these four school systems: the Lorge-Thorndike, the Otis Quick Scoring, and the California Test of Mental Maturity. Although there are difficulties in justifying intelligence test scores derived from three different tests, these tests all yield standard deviation I. Q. 's, and for this reason the scores were utilized without further conversion.

The data for the independent variable, the observation data, were recorded for each of the 11 items composing the three dimensions of teacher-classroom behavior. The total score for an observation was the arithmetic sum of the items. A score was thus available for each observer for each visit for each classroom. Analysis was concerned with the reliability, objectivity, and validity of not only the total schedule but of each of the dimensions and items as well.

The statistical design used in estimating the reliability and objectivity of the schedule was drawn from the model proposed by Medley and Mitzel (71;73). They propose the use of analysis of variance as a better estimate of reliability and one which considers all components of variance.

In this model c teachers are visited in s situations by a team of r recorders to study the reliability of a schedule with i items. The total number of scores to be analyzed is cris. For a given schedule the items are combined to yield a total score which is the arithmetic sum of the parts. It is assumed, in this model, that the 30 classrooms are random samples from the same population of teachers, and the observing teams are a random sample of the same population of teams. The situations are also considered to be a sample of the possible situations which could have been observed for a particular classroom and teacher.

True variance σ_T^2 is the mean of all the scores class c could get with any possible combination of items, recorders, and situations equivalent to the items, situations, and recorders actually used for class c. σ_X^2 is the variance of the obtained scores of all the teacher-classrooms in the population about their obtained mean. The obtained score σ_X^2 contains a true value plus error or $\sigma_X^2 = \sigma_T^2 + \sigma_e^2$. Reliability can be estimated by placing σ_T^2 and σ_X^2 by their best estimates in the formula:

$$r_{xx}(\text{population}) = \frac{\sigma_T^2}{\sigma_X^2} \quad \text{or} \quad \frac{\sigma_T^2}{\sigma_T^2 + \sigma_e^2}$$

By analysis of variance procedures the known sources of variance can be identified and eliminated from the error variance. By thus "shrinking" the error variance a higher reliability is obtained and the variance attributable to various sources can be dealt with in future revisions of the schedule and observation procedures.

A sample of teachers and situations is observed yielding various estimates from which parameter variance estimates can be derived and substituted into the $\frac{\sigma_T^2}{\sigma_X^2}$ formula to yield the reliability coefficient desired.

Two analyses were conducted. A four-way analysis of variance was used to examine the total schedule variance for main, first and second order effects. The total variance was partitioned into class, recorder, item, situation, and interaction effects. The second analysis consisted of a separate two-way analysis of variance for each item of the schedule. Variance was partitioned into class, visit, class-visit interaction and residual (observer error) effects. From these analyses coefficients of reliability and objectivity were utilized as indicated below.

Reliability. Reliability is the comparison of the obtained score with the true score it estimates. In the four-way analysis of variance:

$$\sigma_T^2 = (qjt)^2 \sigma_c^2$$

where q = recorders
j = items
t = situations
c = classes

The variance of the obtained scores σ_X^2 with the same items, recorders, and situations is:

$$\sigma_X^2 = qjt\,(qjt\,\sigma_c^2 + jt\,\sigma_{cr}^2 + qt\,\sigma_{ci}^2 + qj\,\sigma_{cs}^2 + t\,\sigma_{cri}^2 + j\,\sigma_{crs}^2 + q\,\sigma_{cis}^2 + \sigma^2)$$

In the two-way analysis of variance for each schedule item the reliability of a single observation of a classroom would be:

$$R = \sigma_T^2 \,/\, (\sigma_t^2 + \sigma_{tv}^2 + \sigma^2)$$

where t = teacher-classroom
v = visit
tv = interaction

The reliability of a mean score of all performance of a teacher-classroom on all the occasions on which a visit might be made to that teacher can be expressed as:

$$R_{mn} = (mn\,\sigma_t^2 + n\,\sigma_{tv}^2 + \sigma^2)$$

where m = visits
n = observers

Objectivity. Objectivity is estimated by a coefficient of observer agreement:

$$R' = (\sigma_t^2 + \sigma_{tv}^2) / (\sigma_t^2 + \sigma_{tv}^2 + \sigma^2)$$

In this formula, fluctuations in teacher performance from visit to visit were included in the estimate of true score since they could be observed by all observers visiting at the same time. The degree to which the observers did not agree was reflected in their score. It is assumed that this disagreement was due to the subjectivity of the observation schedule, since they all received training in its use and were considered comparable in ability to see and hear the classroom interaction.

Validity. Validity of the observation schedule pertains to its effectiveness in identifying the classrooms in which pupils gain significantly on the creativity measures. It can also be estimated by the degree to which the items interrelate in line with the theory utilized in the construction of the schedule categories (construct validity).

Product-moment correlation was used to determine the relationship of items and the total schedule mean scores with post-test mean scores adjusted for pre-test, I. Q., and socioeconomic status. A procedure for selected contrast comparisons suggested by McNemar (68:285-286). was also employed. In this procedure the significantly different extreme scoring classes on the creativity variable were compared on their observation mean scores to see whether they also differed significantly on these scores. A value, K, was obtained equal to the root of the number of groups in the comparison minus one times the level of F for the desired degree of significance. Any contrast's t ratio, to be significant, must equal or exceed the K value. The items were intercorrelated to see whether they were interrelated according to the hypothesized dimensions and relationships underlying the schedule construction. The following hypotheses comprising that theory were tested:

H_1 The dimensions of the Denny, Rusch, Ives Schedule are true dimensions (i.e., items are homogeneous within dimensions measuring the same classroom-teacher variable).

H_2 Classroom climate is considered essential to pupil creative development, without which other dimensions (teacher structuring) will be less successful.

H_3 With comparable classroom climate and general structuring the higher pupil creativity gain will result in classrooms where specific structuring is high.

In testing H_1, cluster analysis was used to ascertain distinct categories of common factors. In the cluster analysis variables were added to the two variables which correlated the highest, and a B-coefficient was computed. Variables were added until the B-coefficient drops. The B-coefficient is the ratio of the average intercorrelation of the variables in a cluster to their average correlation with the variables not included in the cluster. A B-coefficient of 1.00 would indicate that variables within the cluster correlated no more highly among themselves than they did with variables outside the cluster (42:4). If the dimensions of the Denny, Rusch, Ives Classroom Observation Schedule were true dimensions, the categories of common factors should be congruent with the hypothesized dimensions. This is to say, items purported to compose a single dimension should be highly correlated. Low correlations are expected between items from different dimensions purporting to measure different classroom-teacher variables.

Dimensions and composition items are hypothesized to be:*

Classroom climate

- Pupil response (BA)#
- Teacher respect for pupil contributions (BB)
- Positive peer response to individuality (BC)
- Positive teacher motivation (AA)

General structure

- Initiative (AD)
- Adaptation to individual differences (CA)
- Approach (BD)
- Variation (D)

Specific structure

- Encouragement of divergency (AC, CB)
- Uniqueness (AB)

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*See Chapter III
#Letters refer to items of the observation schedule. See Appendix A.

H_2 and H_3 were tested by using partial correlation. In H_2 the effects of classroom climate were held constant while correlations of teacher-classroom structuring variables with adjusted post-test means on the creativity variable were compared. It was expected that the correlation would be significantly lower with the classroom climate held constant than when it was not.

In H_3 the effects of both classroom climate and general structuring were held constant while correlation of specific structuring and adjusted post-test creativity means were compared. A high positive correlation was expected between high specific structuring and high creativity gain.

Causal relations could not be determined in either of the above analyses.

CHAPTER V

ANALYSIS OF DATA

The purpose of this study was to conduct a preliminary analysis of the reliability, objectivity, and validity of the Denny, Rusch, Ives Classroom Observation Schedule. The schedule was designed to identify the classrooms in which pupil creative thinking was encouraged. The observation schedule was composed of 11 items assessing three dimensions of teacher-classroom behavior. The total score for an observation was the arithmetic sum of the items. A score was thus available for each observer, for each visit, for each classroom.

Three visits were made to each classroom by three observers. This resulted in 99 scores for each teacher. For the total analysis of the 30 teachers this yielded 2,970 separate scores for the 11 items of the observation schedule. Appendix C, Tables 29 and 30, contain the mean scores for each item of the schedule for each classroom and the mean scores for all classrooms for each item of the schedule.

Objectivity and Reliability

The statistical design to estimate the objectivity and reliability of the schedule was drawn from a model proposed by Medley and Mitzel (see Chapter IV). A four-way analysis of variance, factorial design, for the total schedule was performed using the 3400-3600 computer facilities of Indiana University and the BIMED 02V program, 1964 version. Item analysis was performed using this same program for a two-way analysis of variance of each item. The results of these analyses ant their interpretation in terms of reliability and objectivity follow.*

Total schedule analysis. The 2,970 separate scores were analyzed using a four-way analysis of variance. The four main effects in this analysis were variations between classes, between recorders, between items, and between situations. First and second order interaction was also analyzed. The results of this analysis are reported in Table 5. F ratios were computed showing significant differences between categories in each of the main effect variables and for interaction effects at the .01 or .05 level of confidence. Only in three items was no significant difference found. These were the interaction of recorders by situations; of classes, recorders, and items; and of classes, recorders, and situations. This would seem to indicate that, although there were differences between recorders, they were not a factor in the interaction of recorders with situations, of recorders with classes and items, and of recorders with classes and situations. The interaction of recorders, items, and situations was significant at only the .05 level. Since the same recorders observed all classrooms, the difference between recorders (shown in the main effects significant F ratio) did not seem to be an important factor.

TABLE 5. FOUR-WAY ANALYSIS OF VARIANCE OF THE TOTAL OBSERVATION SCHEDULE

Sources of variation	Degrees of freedom	Sum of squares	Mean square	F*	P
Classes	29	951.15	32.80	46.19	.01
Recorders	2	8.63	4.31	6.07	.01
Items	10	24081.52	2408.15	51.00	.01
Situations	2	6.27	3.14	4.42	.05
C x R	58	83.69	1.44	2.02	.01
C x I	290	3792.34	13.08	18.42	.01
C x S	58	736.96	12.71	17.90	.01
R x I	20	119.57	5.98	8.42	.01
R x S	4	5.02	1.25	1.76	NS
I x S	20	36.43	1.82	2.56	.01
C x R x I	580	450.02	.78	1.09	NS
C x R x S	116	98.15	.85	1.19	NS
C x I x S	580	4343.06	7.49	10.54	.01
R x I x S	40	44.10	1.10	1.54	.05
Residual	1160	822.52	.71		
Total	2969	35579.43			

*F computed using residual mean square as the error term with the exception of Items in which a pooled interaction mean square of 47.21 was used.

The primary use of the four-way analysis of variance was to obtain an estimate of reliability for the total observation schedule. Using the formula provided by Medley and Mitzel (73:309-317) parameter components of variance were estimated from the obtained mean square. The estimated components are shown in Table 6.

The estimated components of variance from obtained mean squares were then utilized in the model suggested by Medley and Mitzel to obtain

TABLE 6. ESTIMATED COMPONENTS OF VARIANCE FROM OBTAINED MEAN SQUARE*

1.	σ_c^2	(=)	.141
2.	σ_r^2	(=)	-.002#
3.	σ_i^2	(=)	8.873
4.	σ_s^2	(=)	-.003#
5.	σ_{cr}^2	(=)	.016
6.	σ_{ci}^2	(=)	.613
7.	σ_{cs}^2	(=)	.153
8.	σ_{ri}^2	(=)	.053
9.	σ_{rs}^2	(=)	.000
10.	σ_{is}^2	(=)	-.067#
11.	σ_{cri}^2	(=)	.022
12.	σ_{crs}^2	(=)	.012
13.	σ_{cis}^2	(=)	2.259
14.	σ_{ris}^2	(=)	.013
15.	σ^2	(=)	.709

*Using the formula provided by Medley and Mitzel in Table 22, p. 312, Handbook of Research on Teaching (73)

#Negative components are estimated as zero.

coefficients of reliability. In this formula the true score σ_T^2 was compared with the obtained score σ_X^2 in the formula: $\frac{\sigma_T^2}{\sigma_X^2}$

$\sigma_T^2 = (qjt)^2 \sigma_c^2$ where q = recorders
j = items
t = situations
c = classes

$$\sigma_X^2 = qjt\,(qjt\,\sigma_c^2 + jt\,\sigma_{cr}^2 + qt\sigma_{ci}^2 + qj\sigma_{cs}^2 + t\sigma_{cri}^2 + j\sigma_{crs}^2 + q\sigma_{cis}^2 + \sigma^2$$

Substituting in the above formulas:

$$\sigma_T^2 = (99)^2\ .141$$

$$\sigma_T^2 = 1372.14$$

$$\sigma_X^2 = 99\,[99(.14) + 33(.02) + 9(.61) + 33(.15) + 3(.02) + 11(.01) + 3(2.26) + .71]$$

$$\sigma_X^2 = 3231.36$$

$$r_{qt} = \frac{\sigma_T^2}{\sigma_X^2} = \frac{1372.14}{3231.36} = .42$$

The reliability coefficient for $q = 3$ recorders and $t = 3$ situations was .42.

The above formula can be written as follows to indicate the effects upon the reliability coefficient of changes in the number of observers, items, or situations observed:

$$r_{qt} = \frac{.14\,qtj}{qtj(.14) + jt(.02) + qt(.61) + qj(.15) + t(.02) + j(.01) + q(2.26) + .71}$$

which becomes

$$r_{qt} = \frac{1}{1 + \frac{.14}{q} + \frac{4.36}{j} + \frac{1.07}{t} + \frac{.14}{qj} + \frac{.07}{qt} + \frac{16.14}{tj} + \frac{5.07}{qtj}}$$

Thus, increasing the number of items and situations observed would increase reliability more than would increasing the number of observers, since the components divided by j and t are larger than the ones divided by q.

Further examination of Table 6 indicated that the largest component of variation is between Items, σ_i^2, of the schedule. σ_{ci}^2 also indicates considerable variation from item to item within the same class, although it is not as great as the variation between classes. σ_{cis}^2 indicates that classes vary on different items from situation to situation. Item analysis should result in more homogeneous items and should reduce this variance. The importance of making more than one visit was also emphasized by this variance, since some items were obviously not applicable in every situation observed. The zero variation of σ_r^2 and σ_{rs}^2 indicated that the observers were not biased in favor of any one situation and that they highly agreed. The σ_{cr}^2 of only .016 indicated very little "observer error," since all observers were able to observe the same things during a visit. The σ^2 of .709 indicated that sources of variation not yet identified were present.

__Item analysis__. Each item and dimension subtotal was examined, using a two-way analysis of variance design. In each case hypotheses regarding the ability of the item to differentiate were tested, and, if rejected, coefficients of reliability and observer agreement were computed. The steps in this analysis were as follows:

1. The hypothesis of no significant difference, on the average between records based on a single visit and those based on different visits was tested, $H_1 : \sigma_{tv}^2 = 0$ using s_{tv}^2 / s^2 with degrees of freedom (N - 1) (m - 1) for the larger mean square and Nm (n - 1) for the smaller, where

N = teachers (30)
m = visits (3)
n = observers (3)

2. If H_1 was accepted, it was assumed that $\sigma_{tv}^2 = 0$ and the parameter variance was estimated as:

$$\sigma^2 \quad (=) \quad s_e^2$$
$$\sigma_t^2 \quad (=) \quad (s_t^2 - s_e^2) / mn$$

and zero was substituted for σ_{tv}^2 in the reliability equations. $H_0 : \sigma_t^2 = 0$ stated that the scale failed to discriminate among teachers. This was tested by s_t^2 / s_e^2 with N - 1 and N(mn - 1) - (m - 1) degrees of freedom when H_1 was accepted.

3. If H_1 was rejected it was assumed that $s_{tv}^2 > 0$ and parameter variance was estimated by:

$$\sigma^2 \quad (=) \quad s^2$$
$$\sigma_{tv}^2 \quad (=) \quad (s_{tv}^2 - s^2) / n$$
$$\sigma_t^2 \quad (=) \quad (s_t^2 - s_{tv}^2) / mn$$

H_0 was then tested by s_t^2 / s_{tv}^2 with N - 1 and (N - 1) (m - 1) degrees of freedom.

4. If H_0 was accepted in either of the above steps the reliability of the scale was assumed to be zero. If H_0 was rejected

R and R' were estimated using the following equations:

$$R' = (\sigma_t^2 + \sigma_{tv}^2) \ / \ (\sigma_t^2 + \sigma_{tv}^2 + \sigma^2) \qquad (1)$$

$$R = \sigma_t^2 \ / \ (\sigma_t^2 + \sigma_{tv}^2 + \sigma^2) \qquad (2)$$

$$R_{mn} = mn\,\sigma_t^2 \ / \ (mn\,\sigma_t^2 + n\,\sigma_{tv}^2 + \sigma^2) \qquad (3)$$

Equation 1 yielded a coefficient which pertained to observer agreement and the objectivity of the schedule. Equation 2 referred to the reliability of a single observation of a classroom whereas 3 referred to the reliability of the mean of a number of scores assigned to the same teacher, in this case nine scores, the result of three visits by three observers.

Tables 7 and 8 show the obtained mean square, the estimated parameter variance, the F ratio for H_1 and H_0, and the computed coefficients. In all cases H_1 (that there was no difference, on the average, between records based on a single visit and those based on different visits) was rejected beyond the .01 level of significance. In the test of H_0 (that the scale fails to discriminate among teachers) only for item AB, Uniqueness, was this accepted, resulting in a zero reliability for this item., Since variation on this item was rarely observed, a lack of reliability was anticipated. H_0 was rejected at the .01 level or beyond for all other items with the exception of CA, Adaptation; DA, Variation; and Total General Structure, in which rejection was at the .05 level of confidence.

TABLE 7. OBTAINED MEAN SQUARES FROM THE ANALYSIS OF VARIANCE OF EACH SCHEDULE ITEM WITH THE F RATIOS USED TO TEST $H_1: \sigma_{tv}^2 = 0$ AND $H_0: \sigma_t^2 = 0$

Scale	Obtained mean square				F ratio*	
	Teachers	Visits	T x V	Residual	H_0	H_1
Motivational Climate (AA)	2.766	2.065	.684	.262	4.04	2.61
Pupil-Teacher (BA)	3.358	.676	.889	.496	3.77	1.79
Teacher-Pupil (BB)	3.359	2.160	1.185	.430	2.83	2.76
Pupil-Pupil (BC)	1.834	.810	.741	.370	2.47	2.00
Total Climate	27.898	8.029	4.799	1.901	5.81	2.52
Initiative (AD)	1.131	.032	.316	.110	3.57	2.87
Approach (BD)	4.046	2.849	.941	.475	4.29	1.98
Adaptation (CA)	111.492	.756	69.516	5.579	1.60	12.46
Variation (DA)	13.426	7.033	7.274	.00	1.85	7.27
Total General Structuring	147.907	.545	91.357	6.791	1.61	13.45
Divergency (AC)	4.595	.611	1.072	.173	4.28	5.89
Unusual Response (CB)	17.491	4.311	4.889	1.129	3.58	4.33
Uniqueness (AB)	.064	.043	.072	.037	.88	1.95
Total Specific Structuring	39.197	9.009	8.268	1.550	4.74	5.33

*For H_1 with df = 75, 200 F = 1.35 for .05 level and 1.53 for .01 level.
For H_0 with df = 30, 80 F = 1.60 for .05 level and 1.94 for .01 level.

TABLE 8. SUMMARY OF THE RESULTS OF RELIABILITY ANALYSIS OF THE ELEVEN ITEMS AND DIMENSION SCORES OF THE DENNY, RUSCH, IVES OBSERVATION SCHEDULE

Scale	Estimated parameter variance				Reliability coefficients		
	True score	Visit error	Observer error	Total	R'	R	Rmn
Motivational Climate (AA)	.231	.140	.262	.633	.59	.36	.75
Pupil-Teacher (BA)	.318	.131	.496	.945	.48	.33	.76
Teacher-Pupil (BB)	.241	.251	.430	.922	.53	.26	.65
Pupil-Pupil (BC)	.121	.123	.370	.614	.40	.19	.60
Total Climate	2.566	.966	1.901	5.433	.65	.47	.83
Initiative (AD)	.815	.206	.110	1.131	.90	.72	.91
Approach (BD)	.345	.015	.475	.835	.43	.41	.86
Adaptation (CA)	4.664	21.312	5.579	31.555	.82	.15	.38
Variation (DA)	.683	2.423	.00	3.106	1.00	.22	.45
Total General Structuring	6.283	28.188	6.791	41.262	.84	.15	.38
Divergency (AC)	.391	.299	.173	.863	.80	.45	.77
Unusual Response (CB)	1.400	1.253	1.129	3.782	.70	.37	.72
Uniqueness (AB)	.064	.043	.072	.037	(Zero Reliability)		
Total Specific Structuring	3.436	2.239	1.550	7.225	.79	.48	.79

The coefficients of objectivity (observer agreement) ranged from .40 for Pupil-Pupil (BC) to 1.00 for Variation (DA). The coefficients of the reliability of a single score for one visit ranged from .15 for Total General Structure and CA, Adaptation; to .72 for Initiative (AD). Reliability coefficients for the mean score assigned by a team of three observers over three visits ranged from .38 for Total General Structure to .91 for Initiative.

Table 9 shows the intercorrelation of the observation schedule items. These intercorrelations were studied to assertain relationships between items and possible overlapping items, and items which were either ambiguous or failed to discriminate. The reliability coefficient obtained in the previous analysis was also used in these considerations. Although causal relationships cannot be implied from these correlations, analysis can explore a logical and theoretical basis to explain relationships and to subsequently indicate necessary schedule revision, item eliminations, et cetera.

In the section which follows, a brief description of the item content and an interpretation of the intercorrelations and reliabilities obtained is made. The complete item description can be found in the Directions Manual in Appendix A.

Motivational Climate (AA) referred to the manner in which the teacher motivated the class. Such motivation ranged from a negative, threatening type of motivation, which would be a low score, to a positive,

TABLE 9. INTERCORRELATION OF OBSERVATION SCHEDULE ITEMS USING AVERAGE SCORES FOR ALL VISITS AND OBSERVERS

Schedule items	1	2	3	4	5	6	7	8	9	10	11
1. Motivational Climate (AA)		.34	.80**	.71**	.65**	.78**	.15	.10	.59**	.62**	.10
2. Pupil-Teacher (BA)			.43*	.34	.09	.47**	.50**	.13	.22	.16	.11
3. Teacher-Pupil (BB)				.47**	.28	.63**	.16	.11	.21	.20	-.11
4. Pupil-Pupil (BC)					.65**	.53**	.19	-.04	.61**	.67**	-.15
5. Initiative (AD)						.62**	.05	.11	.83**	.73**	.23
6. Approach (BD)							.32	.35*	.55**	.51**	.10
7. Adaptation (CA)								-.05	.05	.21	-.09
8. Variation (DA)									.09	-.02	.09
9. Divergency (AC)										.88**	.49**
10. Unusual Response (CB)											.47**
11. Uniqueness (AB)											

*Significant at .05 level. **Significant at .01 level or above, using two-tailed test.

self-motivation or stimulation through curiosity, which would be a high score. Motivational Climate was significantly correlated with Teacher-Pupil Relationship, Pupil-Pupil Relationship, Initiative, Teacher Approach, Divergency, and rewarding of Unusual Responses. The rather high correlation of .80 with Teacher-Pupil Relationship, Item BB, may have indicated an overlapping with this item. The correlations of .59 and .62 with Divergency and Unusual Response may have indicated that teachers who deliberately stimulated creativity were aware of the need for a supporting classroom climate.

Pupil-Teacher Relationship (BA) referred to the behaviors of pupils in relation to the teacher behavior. This item consisted of a positive-negative dichotomy in which behaviors such as "eager response in recitation" and "worked intently" were contrasted with their opposites. An examination of the intercorrelations showed the Pupil-Teacher item to be more closely related to General Structuring items (Approach, .47, and Adaptation, .50) than to the items in the Climate dimension. The exception to this was a correlation of .43 with Teacher-Pupil (BB). This may have indicated that pupil response was a function of General Structuring rather than Climate, or it may have been observable only when General Structuring allowed overt pupil response. Pupil-Teacher was a difficult item to observe as evidenced by the low reliability coefficient for observers (.48). The significant correlation with teacher-to-pupil behaviors may have indicated that the pupil-to-teacher response was a function of the teacher behavior.

Teacher-Pupil (BB) referred to the manner in which the teacher responded to pupils. It was a dichotomized dimension in which such behaviors as "teacher responded positively to contribution" and "teacher used 'We' approach" were contrasted with their opposites. This item seemed to overlap with Motivational Climate, correlating with Motivational Climate at .80. It also correlated with Pupil-Teacher at .43. This was a logical relationship which indicated that pupils responded positively to teacher behaviors. The item had low nonsignificant correlations with all the other items except Pupil-Pupil and Approach, two items with which Motivational Climate also correlated highly. The reliability coefficients for Teacher-Pupil were adequate but lower than those for Motivational Climate. It is possible that this item could have been merged with Motivational Climate or eliminated.

Pupil-Pupil Relationship (BC) referred to dichotomized situations in which positive behaviors, such as "children refer positively to success of others" and "children share responsibility," were contrasted with negative opposites. This item had a low observer reliability coefficient of .40, which resulted largely from the infrequency of opportunity, in this sample, to observe pupil-pupil interaction. The most frequent activities--text-seat, oral quiz, and lectures (see Table 4)--prohibited observation of pupil-pupil interaction. As a result, observers tended to score slight behaviors which were easily misinterpreted, resulting in lack of agreement between observers. Correlations of .71 and .47 with Motivational Climate and Teacher-Pupil Relationship tended to substantiate the belief that the climate of the classroom initiating with the teacher set the tone for Pupil-Pupil Relationships. The correlation of .53 with Teacher Approach also supported this theory. This item also correlated with Initiative (.65). The relationship with Initiative was a logical one for, in order to observe Pupil-Pupil interaction, a degree of pupil participation and control in the learning situation was necessary. The correlation with Divergency (.61) and Unusual Response (.67) would seem to have been related to the fact that, when the classroom was scored for Divergency or Unusual Response, these behaviors also included opportunity for pupil reaction to their fellow pupil's divergent and unusual response, thus providing a score in the Pupil-Pupil category.

Pupil Initiative and Control of Instruction (AB) referred to the degree to which the pupil was able to participate in controlling the content, speed, direction, or method of instruction. The score ranged from a low of "teacher domination--no pupil participation," in which the teacher was exercising autocratic control, to a high in which the pupil was in major control of the learning situation. This item was used with the permission of Francis G. Cornell having been developed by him and his associates at the University of Illinois in 1952 (25). Perhaps as a result of Cornell's analysis and previous development of this item, it resulted in high reliability coefficients (R', .90 and Rmn, .91). Initiative correlated .62 with Approach (BD), an item within the hypothesized General Structuring dimension. Higher correlations were with Divergency (.83) and Unusual Response (.73), both of which were items in the Specific Structuring dimension. This may have indicated the necessity for a change in the underlying theory of the dimension construction, it may have supported the theory which indicated favorable General Structuring was a prerequisite for Specific Structuring behaviors. The parallel between less teacher control and the encouragement of divergency was a logical one. The relationship of Divergency and Initiative may have been a case of observer bias in which a high score on Initiative caused the observer to also score highly on Divergency. However, the data regarding observer variance would not seem to have indicated this to be the case. A more plausable explanation was that there was a lack of distinction at the lower end of each of these scales. Pupil Participation in Control and Pupil Divergent Response may not have been clearly differentiated.

The correlation of Initiative with Pupil-Pupil Relationships (.65) was a logical one. In order for Pupil-Pupil Relationship to be observed and scored it was necessary that a certain amount of pupil initiative be operant. A correlation of .65 with Motivational Climate was also logically interpreted in that the type of motivation the teacher employed tended to vary with the degree of pupil control allowed.

Teacher Group Approach (BD) was a dichotomized item in which the positive extreme referred to "teacher introduction which sets off pupil interest" and "teacher response to pupil questions and comments" as opposed to the negative opposites. This item correlated significantly with all items of the observation schedule except Adaptation (CA). In light of this relationship this item may have indicated a "pupil-centered" versus "teacher-centered" situation which was inherent in all the teacher behavior items. The lower but significant correlation of this item to pupil behavior items may have supported this interpretation. Although this item had a reliability coefficient for the mean of the three visits of .86, the coefficient of observer agreement was only .43, which indicated that the item needed revision to make it more objective.

Teacher allowance for individual differences (Adaptation, CA) was a score obtained by tallying the number of different individuals with whom the teacher spent time and the number of times the teacher differentiated for individuals. These two scores were then related to the total number of pupils present during the observation in a formula to obtain a "differentiation index." (See Appendix A) This item had low, sometimes negative, correlations with all other items except Pupil-Teacher Relationship (.50). The relationship with Pupil-Teacher was probably found because pupil response was elicited when the teacher differentiated for individuals. This item had a coefficient of observer agreement of .82 in spite of the fact that the observers found it difficult to keep an accurate tally of the number of different individuals with whom the teacher spent time. The coefficient of .38 for reliability of the average score over all visits may have been a result of the effect of the type of lesson content. For example, a silent reading lesson provided for less differentiation than a discussion.

Variation in Amount of Activities and/or Materials of Instruction Used (DA) referred to a score obtained by simply counting the number of different activities and materials of instruction. This item correlated low or negatively and nonsignificantly with all of the other items in the schedule with the exception of Approach (.35). A perfect coefficient of observer agreement indicated the ease with which this score was obtained. A low coefficient of reliability may have been due to the effect of subject-matter content variation from visit to visit. At any rate, this item was questionably related to the others in the schedule.

Teacher Role in Encouraging Convergent and Divergent Thinking (AC) referred to teacher encouragement of divergency through questions asked or activities conducted as opposed to encouragement of convergency and suppression of divergency. Teacher Role correlated highly with Unusual Response (AC). This correlation of .88 may have been due to an overlap with the Unusual Response item in that unusual response occurred where divergency was allowed, and thus it would have been necessary to obtain a high divergency score in order for a high unusual response score to have been obtained. The correlation of Divergency with Initiative (.83) may have indicated that Initiative was a precondition of Divergency as theorized. The correlation of .55 with Approach and of .59 with Motivational Climate may have tended to support the hypothesis that these three conditions were necessary for Specific Structuring such as Divergency. High coefficients of observer agreement (.80) and reliability (.77) were reported for Divergency.

Teacher Encouragement of Unusual Response (CB) consisted of a score obtained by tallying the number of times the teacher encouraged unusual pupil response by direct or indirect reward. This item had respectable reliability coefficients of .70 for observer agreement and .72 for reliability of an average score obtained for three visits. The item correlated at .88 with Divergency, another item in the Specific Structuring dimension. It was also related to Climate (.62), Initiative (.73), and Teacher Approach (.51). These were logical relationships, since pupils must be free to respond unusually and Climate and Approach were related to the degree of Initiative available.

Variation in amount of Uniqueness (AB) referred to the amount of uniqueness in the use of materials and/or activity of instruction as opposed to the standard use. The scale ranged from highly standard use in which standard activities and/or materials were being used in the usual manner for all the children, to highly unique use during which the materials and/or activities were being used uniquely by the total class. This item had a zero reliability because of the lack of variability in the classrooms observed. However, when the item was observed, it resulted in a significant correlation with Divergency and Unusual Response pointing to the possible significance of this item in another sample of classrooms.

Validity

The dependent variable in this study was pupil creativity. The independent variable was teacher-classroom interaction. By comparing the independent and dependent variables an indication of the validity of the schedule was obtained.

Prior to the validity analysis, the creativity tests were examined to obtain an estimate of their reliability and validity as measures of creativity. Table 10 shows coefficients of agreement between scorers.

TABLE 10. COEFFICIENTS OF AGREEMENT BETWEEN SCORERS COMPUTED FOR A RANDOM SAMPLE OF THREE CLASSROOMS FOR EACH TEST

Test	Range of coefficients	N
Problems Test		
(Sensitivity)	.97 to .99	27 to 32
Alternate Uses		
(Flexibility)	.94 to .98	24 to 27
Consequences		
(Fluency)	.94 to .99	15 to 36
(Originality--Remote)	.86 to .99	
Plot Titles		
(Originality--Clever)	.67 to .91	11 to 37

Since all but one of the tests in the battery required scorer interpretation, scorer agreement for each of these tests was determined. A random sample of three classrooms was selected for each test and a coefficient of correlation computed between scores independently assigned by two scorers. As shown in Table 10 these coefficients ranged from .67 to .99, the lowest being obtained for the Plot Titles test, which required a judgment of the degree of cleverness of pupil response.

The Spearman-Brown formula was used to obtain a split-halves reliability coefficient for a random sample of classrooms (86 pupils). Table 11 shows that these coefficients ranged from .31 for the Plot Titles test to .79 for the Problems test. The split-halves test was applicable,

TABLE 11. TEST RELIABILITY COEFFICIENTS FOR A RANDOM SAMPLE OF THREE CLASSROOMS COMPUTED USING THE SPEARMAN-BROWN SPLIT-HALVES FORMULA (N=86)

Test	Reliability
Gestalt Transformation	
(Redefinition)	.50
Alternate Uses	
(Flexibility)	.77
Plot Titles	
(Originality--Clever)	.31
Problems Test	
(Sensitivity)	.79
Consequences	
(Fluency)	.73
(Originality--Remote)	.45

since each test was composed of two or more parts which were timed separately. Only on the Gestalt Transformation test did the split-halves consist of alternate items for a single timed test.

Intercorrelation of creativity pre-test and post-test battery sub-tests are reported in Table 12. Low, positive correlations were found similar to those obtained by Guilford and others who used similar tests. It can be argued that these low, positive correlations indicate that the

TABLE 12. INTERCORRELATION OF CREATIVITY PRE-TEST AND POST-TEST BATTERY SUBTESTS* (N=778)

Item	1	2	3	4	5	6	7
1. Redefinition		.45	.33	.28	.29	.35	.58
2. Flexibility	.40		.40	.49	.51	.59	.80
3. Originality--Clever	.25	.40		.26	.34	.34	.53
4. Sensitivity	.21	.45	.18		.40	.57	.77
5. Originality--Remote	.18	.27	.25	.26		.66	.71
6. Fluency	.27	.46	.23	.49	.55		.84
7. Total	.52	.76	.44	.78	.52	.79	

*Post-test correlations are above the diagonal; pre-test correlations are below the diagonal.

tests are related aspects of the same entity, "creativity."

Table 13 shows the correlation of post-test creativity scores with peer nomination and interest inventory scores. Appendix D contains copies of the forms used. Similar devices have shown some relationship to creativity (113:41-45). The low, positive correlations obtained would seem to lend support to the validity of the tests.

TABLE 13. CORRELATION OF POST-TEST CREATIVITY SCORES AND PEER NOMINATION AND INTEREST INVENTORY SCORES*

Test	Peer nomination (N=566)	Interest inventory (N=776)
Redefinition	.20	.10
Flexibility	.24	.12
Originality--Clever	.21	.04
Sensitivity	.14	.23
Originality--Remote	.24	.15
Fluency	.26	.18
Total	.28	.21

*For 500 df. .088 is significant at .05 level and .115 at the .01 level.

Tables 26 and 27 in Appendix C are records of the mean creativity pre-test and post-test scores for each classroom and the means for all classrooms. Intelligence test scores and a socioeconomic rating based upon parental occupation were obtained for the purpose of adjusting the post-test mean creativity score for these variables. Table 2, in Chapter IV, showed the mean I.Q. and Socioeconomic scores for each classroom.

The I.Q. and Socioeconomic ratings were correlated with the pre-test and post-test creativity test scores, as shown in Table 14. These correlations indicated that it would not be necessary to adjust post-test scores for socioeconomic rating, since the correlations were very low.

TABLE 14. CORRELATION OF CREATIVITY POST-TEST BATTERY SUBTESTS WITH PRE-TEST SUBTESTS, I.Q., AND SOCIOECONOMIC RATING (N=778)

Post-test subtests	Pre-tests	I.Q.	Socioeconomic status
Redefinition	.56	.44	.15
Flexibility	.67	.53	.30
Originality--Clever	.49	.38	.16
Sensitivity	.55	.40	.16
Originality--Remote	.31	.41	.20
Fluency	.60	.49	.23
Total	.75	.61	.29

For this reason analysis of co-variance was used to adjust post-test scores for only pre-test and I.Q. test scores.

Table 15 shows the adjusted post-test scores for each classroom. It will be noted that no adjustment was made of the originality scores.

TABLE 15. POST-TEST CREATIVITY SCORES ADJUSTED BY ANALYSIS OF CO-VARIANCE FOR PRE-TEST CREATIVITY SCORES AND I.Q. SCORES (N=778)

Class	Total	Fluency	Sensitivity	Flexibility	Redefinition
1	49.71	10.89	18.25	9.79	7.20
2	44.43	9.90	16.08	8.99	8.05
3	46.88	11.21	16.05	9.20	6.81
4	45.39	9.43	19.88	8.60	7.90
5	48.90	11.45	17.65	8.00	7.46
6	44.99	8.52	16.35	8.46	7.03
7	49.70	11.29	17.59	9.59	7.82
8	45.05	10.56	13.83	8.08	8.08
9	43.54	9.34	16.67	7.52	6.64
10	47.19	11.53	17.26	7.77	6.64
11	44.65	10.33	14.50	8.66	5.99
12	48.31	10.85	15.79	9.71	6.04
13	50.35	11.37	19.06	8.64	6.13
14	52.15	13.44	19.18	8.02	7.18
15	48.91	11.09	17.73	9.50	6.54
16	51.49	11.76	18.12	9.85	7.13
17	47.52	12.48	17.05	8.53	7.51
18	55.17	14.54	17.70	9.24	7.09
19	46.58	11.58	17.48	7.55	7.09
20	47.43	10.83	16.28	8.47	7.14
21	52.44	10.73	18.54	10.21	7.63
22	42.88	9.20	15.50	7.84	6.98
23	42.58	9.20	16.05	7.70	7.07
24	50.11	11.99	18.09	9.26	6.67
25	44.51	11.62	15.01	7.60	7.58
26	48.58	11.03	17.49	9.63	6.39
27	49.65	12.57	16.73	9.54	5.91
28	51.63	9.95	18.08	11.22	7.53
29	47.24	10.13	14.93	9.88	7.39
30	47.84	11.16	16.31	8.25	7.10

These scores were not analyzed because of the lack of dispersion and skewness evidenced in these scores for this sample of classrooms (see Tables 26 and 27 in Appendix C).

Predictive validity. The restricted range of scores for both the independent and dependent variables caused difficulties in detecting significant relationships between these variables. Some significant relationships were found when mean observation scores were correlated with creativity post-test scores adjusted by analysis of co-variance for initial creativity test scores and for I. Q. test scores. Table 16 shows these correlations.

TABLE 16. CORRELATION OF ADJUSTED CREATIVITY POST-TEST SCORES WITH MEAN OBSERVATION SCORES FOR ALL VISITS (N=30)

Observation score	Adjusted test score				
	Fluency	Sensitivity	Flexibility	Redefinition	Total
Motivational Climate (AA)	-.25	-.23	.18	.36**	-.12
Pupil-Teacher (BA)	-.02	-.47*	.07	.03	-.14
Teacher-Pupil (BB)	-.44**	-.41**	.10	.37**	-.40**
Pupil-Pupil (BC)	-.08	.00	.17	.38**	.08
Total Climate	-.22	-.39**	.16	.33***	-.18

TABLE 16. (Continued)

Observation score	Adjusted test score Fluency	Sensitivity	Flexibility	Redefinition	Total
Initiative (AD)	.15	.09	.35***	.00	.32***
Approach (BD)	.00	-.15	.38**	.21	.11
Adaptation (CA)	-.06	-.11	.12	.12	.08
Variation (DA)	.02	.01	.24	.09	.06
Total General Structuring	.03	-.11	.26	.17	.14
Divergency (AC)	.13	-.05	.15	-.09	.21
Unusual Response (CB)	.06	.00	.12	.08	.21
Uniqueness (AB)	.17	.23	-.15	-.13	.11
Total Specific Structuring	.09	.00	.13	.03	.22
Grand Total	.05	-.18	.26	.20	.11

*A coefficient of ± .36 or above is significant at .05 level, 28 df.
**A coefficient of ± .46 or above is significant at .01 level, 28 df.
***A coefficient of ± .31 or above is significant at .10 level, 28 df.

Relationships of observation scores and adjusted creativity post-test scores were further analyzed using selected contrast comparisons (see Chapter IV). In this comparison clusters of seven classes, with means significantly different at the .01 level on each post-test of creativity after covariance adjustments, were compared to see whether their observation mean scores also differed significantly. A t ratio was computed for each comparison. The computed t was tested against a K value for significance. The sampling error variance used in this computation was the analysis of variance residual mean square reported previously in Table 7. Tables 17 through 22 report the mean scores and the computed t's for each contrast comparison.

In two cases clusters of classes differing significantly on the creativity variable also differed significantly on the Total Observation score (with both differences beyond the .01 level). The seven classes scoring high on the Flexibility test, as shown in Table 17, also scored high on the Total Observation schedule. The seven scoring high on the Redefinition test, as shown in Table 18, also scored high on the Total Observation schedule. Since the post-test means were adjusted to equalize for initial pre-test levels and I. Q., it can be said that the classes which gained most on Redefinition and Flexibility were those which scored significantly higher on the Total Observation schedule.

The seven classes scoring significantly high on the Redefinition test (Table 18) also scored significantly high on the Pupil-Pupil observation item (.01 level) and higher than the low seven classes on the Motivational Climate and Approach items (.10 level). Further, significant positive correlations were found between Redefinition and the Teacher-Pupil item and between Redefinition and the Total Climate dimension

TABLE 17. COMPARISON OF MEAN OBSERVATION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON MEAN ADJUSTED POST-TEST FLEXIBILITY SCORE

Item	Average of high scoring classes (N=7)	Average of low scoring classes (N=7)	Difference	t	P
Motivational Climate	3.85	3.72	.13	1.44	NS
Pupil-Teacher	2.41	2.35	.06	.48	NS
Teacher-Pupil	2.86	2.76	.10	.88	NS
Pupil-Pupil	.99	.77	.22	2.09	NS
Total Climate	10.12	9.62	.50	2.07	NS
Initiative	2.19	1.86	.33	18.33	.01
Approach	2.68	2.12	.56	4.66	.10
Adaptation	12.66	10.34	2.32	5.65	.01
Variation	6.24	5.90	.34	.57	NS
Total General Structure	23.77	19.39	4.38	9.56	.01
Divergency	2.39	2.15	.24	3.33	NS
Unusual Response	1.90	1.49	.41	2.19	NS
Uniqueness	1.01	1.07	-.06	1.81	NS
Total Specific Structure	5.31	4.72	.59	2.73	NS
Grand Total	39.22	33.73	5.49	9.07	.01

K=5.54 for .01 level, 4.90 for .05 level, and 4.56 for .10 level--high classes 28, 21, 29, 16, 1, 12, 7--low classes 5, 23, 22, 10, 25, 19, 9.

TABLE 18. COMPARISON OF MEAN OBSERVATION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON MEAN ADJUSTED POST-TEST REDEFINITION SCORE

Item	Average of high scoring classes (N=7)	Average of low scoring classes (N=7)	Difference	t	P
Motivational Climate	3.80	3.36	.44	4.83	.10
Pupil-Teacher	2.27	2.34	-.07	.59	NS
Teacher-Pupil	2.61	2.44	.17	1.44	NS
Pupil-Pupil	.85	.04	.81	7.61	.01
Total Climate	9.93	8.63	1.30	.54	NS
Initiative	1.93	1.84	.09	1.80	NS
Approach	2.58	2.02	.56	4.66	.10
Adaptation	10.91	10.47	.44	1.04	NS
Variation	6.66	5.80	.86	1.79	NS
Total General Structure	22.02	20.19	1.83	3.98	NS
Divergency	2.16	2.15	.01	.14	NS
Unusual Response	1.41	.77	.64	3.44	NS
Uniqueness	1.02	1.01	.01	.30	NS
Total Specific Structure	4.60	3.94	.66	3.00	NS
Grand Total	36.56	32.76	3.80	6.28	.01

K=5.54 for .01 level, 4.90 for .05 level, and 4.56 for .10 level--high classes 2, 4, 7, 21, 17, 25, 28--low classes 9, 24, 26, 13, 12, 11, 27.

TABLE 19. COMPARISON OF MEAN OBSERVATION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON MEAN ADJUSTED POST-TEST SENSITIVITY SCORE

Item	Average of high scoring classes (N=7)	Average of low scoring classes (N=7)	Difference	t	P
Motivational Climate	3.41	3.94	-.53	5.88	.01
Pupil-Teacher	1.76	2.51	-.75	6.07	.01
Teacher-Pupil	2.47	3.05	-.58	5.08	.05
Pupil-Pupil	.80	.67	.13	1.27	NS
Total Climate	8.47	10.19	-1.72	7.10	.01
Initiative	1.99	1.95	.04	.70	NS
Approach	2.16	2.51	-.35	2.92	NS
Adaptation	10.27	9.95	.32	.77	NS
Variation	5.75	5.71	.04	3.07	NS
Total General Structure	20.20	20.14	.06	.13	NS
Divergency	2.06	2.26	-.20	2.74	NS
Unusual Response	1.34	1.30	.04	.21	NS
Uniqueness	1.03	1.00	.03	.90	NS
Total Specific Structure	4.47	4.57	-.10	.45	NS
Grand Total	33.14	34.90	-1.76	2.90	NS

K=5.54 for .01 level, 4.90 for .05 level, and 4.56 for .10 level--high classes 4, 14, 13, 21, 1, 16, 28--low classes 3, 12, 22, 25, 29, 11, 8.

TABLE 20. COMPARISON OF MEAN OBSERVATION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON MEAN ADJUSTED POST-TEST FLUENCY SCORE

Item	Average of high scoring classes (N=7)	Average of low scoring classes (N=7)	Difference	t	P
Motivational Climate	3.50	3.62	-.12	1.33	NS
Pupil-Teacher	2.42	2.33	.09	.72	NS
Teacher-Pupil	2.26	2.95	-.69	6.05	.01
Pupil-Pupil	.76	.71	.05	.47	NS
Total Climate	9.15	9.62	-.47	1.94	NS
Initiative	1.95	1.74	.21	3.68	NS
Approach	2.38	2.16	.22	2.00	NS
Adaptation	11.66	10.43	1.23	9.38	.01
Variation	6.04	6.14	.10	.36	NS
Total General Structure	22.01	20.53	1.48	3.28	NS
Divergency	2.16	1.77	.39	5.41	.05
Unusual Response	1.14	.68	.46	2.47	NS
Uniqueness	1.03	1,01	.02	.61	NS
Total Specific Structure	4.36	3.46	.90	4.10	NS
Grand Total	35.53	33.63	1.90	3.14	NS

K=5.54 for .01 level, 4.90 for .05 level, and 4.56 for .10 level--high classes 18, 14, 27, 17, 24, 16, 25--low classes 28, 2, 4, 9, 23, 22, 6.

TABLE 21. COMPARISON OF MEAN OBSERVATION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON MEAN ADJUSTED POST-TEST TOTAL SCORE

Item	Average of high scoring classes (N=7)	Average of low scoring classes (N=7)	Difference	t	P
Motivational Climate	3.55	3.64	-.09	-1.00	NS
Pupil-Teacher	2.02	2.58	.56	4.52	NS
Teacher-Pupil	2.32	2.93	-.61	5.30	.05
Pupil-Pupil	.82	.58	.24	2.26	NS
Total Climate	8.72	9.73	-1.01	4.17	NS
Initiative	2.04	1.72	.32	6.15	.01
Approach	2.33	2.18	.15	.13	NS
Adaptation	10.46	10.96	-.50	1.18	NS
Variation	5.99	5.80	.19	.04	NS
Total General Structure	20.74	20.68	.06	.13	NS
Divergency	2.32	1.91	.41	5.61	.01
Unusual Response	1.66	.68	.98	.53	NS
Uniqueness	1.03	1.01	.02	.71	NS
Total Specific Structure	5.04	3.61	1.43	6.85	.01
Grand Total	34.57	34.09	.48	.79	NS

K=5.54 for .01 level, 4.90 for .05 level, and 4.56 for .10 level--high classes 18, 14, 21, 28, 16, 13, 24--low classes 22, 9, 25, 23, 11, 6, 2.

TABLE 22. COMPARISON OF MEAN OBSERVATION DIMENSION SCORES OF CLUSTERS OF CLASSES WHICH DIFFER SIGNIFICANTLY ON AT LEAST THREE SUBTESTS AND THE TOTAL ADJUSTED POST-TEST OF CREATIVITY (N=8)

Dimension	Average of high scoring classes (N=4)	Average of low scoring classes (N=4)	Difference	t	P
Classroom Climate	8.90	7.98	.92	2.80	NS
General Structuring	20.37	16.52	3.85	6.27	.01
Specific Structuring	6.02	2.67	3.35	11.43	.01
Total Observation	35.31	27.18	8.13	10.04	.01

K=3.89 for .05 level and 4.54 for .01 level--high classes 21, 14, 28, 24--low classes 9, 22, 4, 13.

(significant at .05 and .10 levels).

The seven significantly high classes on Flexibility (Table 17) also scored significantly high on the Initiative observation item and Total General Structure observation dimension (significant at .01 level). At a low significance level (.10) the high classes on Flexibility also were high on the Teacher Approach item.

The seven classes significantly high on the Sensitivity test, as shown in Table 19, were significantly low on most of the Climate dimension observation items and on the Total Climate observation score. Significant negative correlations were found between all these items except Motivational Climate. The Pupil-Pupil item was the only exception to this reverse relationship of climate items to pupil gain in Sensitivity. Pupil-Pupil scores did not show any significant relationship to Sensitivity.

The comparison of classes significantly different on the Fluency test, shown in Table 20, revealed significant differences on only three observation items. Low scores on the Teacher-Pupil item were significantly related (.01) to high Fluency scores. Adaptation was significantly (.01 level) related to Fluency, with high adaptation related to high fluency. High scoring fluency classrooms were significantly high (.05 level) on the Divergency item of the observation schedule.

The seven classes scoring significantly high on the adjusted Total Creativity test, shown in Table 21, also scored significantly high on Total Specific Structuring, Divergency, and Initiative observation items. These classes were significantly lower, however, on the Teacher-Pupil observation score (significant at the .05 level) than were the seven classes which scored low on the Total Creativity test.

Interpretation of the validity of the schedule and of each schedule item and dimension, drawing upon the correlation and selected contrast comparisons, was difficult owing to the seemingly conflicting relationships found. This was undoubtedly the result of multiple factors: the limited dispersion of scores, the low correlation between subtests, the limited sample of classroom behaviors obtained over only three visits, and the interaction effect of classes and tests. Classes did not score uniformly high on all tests. In at least two cases (classes 4 and 13) a reversal resulted and classes significantly high on Sensitivity were low on other tests in the battery. By taking eight classes for cluster contrast comparison, four of which were consistently significantly high scoring and four which were consistently and significantly low scoring on at least three subtests and the total test, it was found that all observation dimension differences were in the direction of a positive relationship. This comparison is shown in Table 22. That is, high scores on the schedule related to high gain scores on the creativity variable. Significant differences (.01 level) were found for all but the Classroom Climate dimension. Since two of the classes used in this comparison reversed position (classes 4 and 13 were low scoring on Sensitivity but high scoring on the other tests), it cannot be determined whether or not Classroom Climate was related to the other dimensions or whether this was a result of the Sensitivity test's lack of relationship to the others in the battery.

Table 23 presents a summary of the validity data drawn from the correlation and cluster relationships. The significant relationships observed in the contrast analysis provided evidence of some definite relationships. Also, the generally positive direction and relationship

TABLE 23. SUMMARY OF VALIDITY DATA SHOWING SIGNIFICANT RELATIONSHIPS OF OBSERVATION SCORE ITEMS TO ADJUSTED CREATIVITY TEST MEAN SCORES*

Item	Fluency	Sensitivity	Flexibility	Redefinition	Total
Motivational Climate		-		+	
Pupil-Teacher		-			
Teacher-Pupil	-	-		+	-
Pupil-Pupil				+	
Total Climate		-		+	
Initiative			+		+
Approach			+	+	
Adaptation	+		+		
Variation					
Total General Structure			+		
Divergency	+				+
Unusual Response					
Uniqueness					
Total Specific Structure					+
Grand Total			+	+	

* + indicates a positive relationship; - indicates a negative relationship; no sign indicates no significant relationship.

of the high scoring classrooms on the dependent variable with high scoring classrooms on the independent variable yielded promise for subsequent study and use of the schedule.

Construct validity. The degree to which the observation schedule items and dimensions related to one another and to the dependent variable gave an indication of the construct validity of the schedule. Three hypotheses comprising the theory underlying the construction of this schedule were examined.

H_1--The dimensions of the Denny, Rusch, Ives Schedule are true dimensions (i. e., items are homogeneous within dimensions measuring the same classroom-teacher variable).

H_2--Classroom climate is considered essential to pupil creative development without which other dimensions (teacher structuring) will be less successful.

H_3--With comparable classroom climate and general structuring, the higher pupil creativity gain will result in classrooms where specific structuring is high.

In testing H_1 cluster analysis was used from a table of intercorrelations of items to ascertain distinct categories of common factors. If the dimensions of the Denny, Rusch, Ives Schedule were true dimensions, the categories of common factors should have been congruent with the hypothesized dimensions. In other words, the items purported to compose a single dimension should have been highly correlated. Low correlations were expected between items from different dimensions purporting to measure different classroom-teacher variables. Reference to Table 10 will show the intercorrelation of items in the observation schedule. These items were analyzed using cluster analysis (see Chapter IV), and two clusters were established. Cluster I consisted of Initiative (AD), Divergency (AC), and Unusual Response (CB). The mean intercorrelation of the items within the cluster was .81 and the mean intercorrelation of the items without the cluster was .34. The B coefficient, the ratio of the average within cluster correlation to the without correlation, was 2.40.* This would tend to indicate a strongly clustered group of items. Cluster I was similar to the Specific Structuring dimension with the addition of Initiative and the deletion of Uniqueness, an unreliable item.

The second cluster, II, consisted of five items: Motivational Climate (AA), Pupil-Teacher (BA), Teacher-Pupil (BB), Pupil-Pupil (BC), and Approach (BD). The mean intercorrelation within the cluster for these five items was .55 and the mean intercorrelation for the remaining items was .29. A B coefficient of 1.84 was obtained. Table 24 shows the clusters of items obtained using cluster analysis with their B coefficient. These relationships would in part support the dimensions hypothesized.

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*The goal is to obtain the highest possible set of B coefficients. A B coefficient of 1.30 has been set as the minimum significant value (42:14).

TABLE 24. CLUSTERS OF ITEMS OBTAINED USING CLUSTER ANALYSIS

	Items composing the cluster	Mean inter-correlation within the cluster	Mean inter-correlation of remaining items	B coefficient*
I.	AD, AC, CB	.813	.346	2.40
II.	AA, BA, BB, BC, BD	.550	.298	1.84

*A B coefficient of 1.00 would indicate that variables within the cluster correlate no more highly among themselves than they do with variables outside the cluster.

Cluster II contained all of the Climate dimension items plus item BD, Approach, from the General Structuring dimension. Cluster I contained two of the items from Specific Structuring, Divergency (AC), and Unusual Response (CB), plus Initiative (AD) from the General Structuring dimension. Three items, Adaptation (CA), Variation (DA), and Uniqueness (AB) did not appear to cluster with any of the others or with one another to a significant degree. Item AB, Uniqueness, although related as hypothesized to Divergency and Unusual Response, with correlations of .49 and .47, would cluster with the items in Cluster I with a B coefficient of 2.27.

However, this appeared to be spurious because the low frequency of occurrence of Uniqueness in this sample and of the zero reliability for this item. Item CA, Adaptation, related only significantly with Pupil-Teacher, a logical relationship (r=.50). It did not seem to relate to the other items and might not owing to the inclusion of both convergent and divergent activities within Adaptation--that is, the teacher can respond and obtain a score here for working with the child when either divergent or convergent response was being rewarded. Also, oral quiz situations tended to inflate Adaptation, and this would be opposed to the divergent and unusual response areas. Variation (DA) correlated at .35 (significant at the .05 level) with Approach. This could have been explained in that Approach included items which dealt with teacher introduction, use of materials, et cetera. Thus a high score here would have been related logically to a high score on the Variation item which included a listing of the materials and activities of instruction used.

The validity of the Climate dimension and the Specific Structuring dimension seemed to be supported by the cluster analysis intercorrelation of items. The General Structuring dimension, however, did not seem to be a true dimension.

H_2 and H_3 were tested by using partial correlation. In testing H_2 the effects of classroom Climate were held constant while the correlations of teacher-classroom structuring variables with adjusted post-test means on the creativity variable were compared. It was expected that the correlation would be lower when the classroom Climate was held constant than when it was not, thus indicating that classroom Climate was essential to pupil creative development without which other dimensions (teacher structuring) would be less successful.

In testing H_3 the effects of classroom Climate and General Structuring were held constant while the correlation of Specific Structuring and adjusted post-test creativity means were compared. A higher, positive correlation was expected between Specific Structuring and creativity gain. Thus, this would have shown that with comparable classroom Climate and General Structuring higher pupil creativity gain would have resulted in classrooms where Specific Structuring was high. Table 25 shows the results of the partial correlations. It will be noted

TABLE 25. PARTIAL CORRELATIONS OF OBSERVATION DIMENSIONS WITH CREATIVITY POST-TEST ADJUSTED MEANS HOLDING CLIMATE AND GENERAL STRUCTURING CONSTANT*

Variables and their combinations	Post-tests				
	Total	Fluency	Sensitivity	Flexibility	Redefinition
General Structuring holding Climate constant	.27 (.14)	.09 (-.03)	.10 (-.11)	.22 (.27)	.01 (.17)
Specific Structuring holding Climate constant	.37# (.22)	.24 (.09)	.26 (.01)	.06 (.13)	-.17 (.03)
Specific Structuring holding Climate and General Structuring constant	.38# (.22)	.01 (.09)	.26 (.01)	.05 (.13)	.16 (.03)

*Coefficient in parenthesis is the before partial correlation coefficient.

#Significant at .05 level.

that the hypotheses were not conclusively proved or refuted by this analysis. In the case of the Total Creativity test and the Fluency and Sensitivity tests, the scores were higher for General Structuring and Specific Structuring when Climate was held constant, thus reversing the hypothesis. However, for the Flexibility and Redefinition tests the correlation dropped when Climate was held constant, which tended to support H_2. In the test of H_3 the correlation became higher for Total Creativity, Sensitivity, and Redefinition when Climate and General Structuring were held constant. The reverse was true for Fluency and Flexibility.

These relationships would seem to indicate that Climate did not necessarily relate positively to creativity development as hypothesized. Since the results of the partical correlation were mixed and the differences were not large between correlation coefficients, these hypotheses could not be conclusively tested in this study. Also, the effects of schedule items lacking high reliability and effects of overlapping items tended to confuse the hypothesized relationships.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Purpose of the study. The purpose of this research was to conduct a preliminary analysis of the Denny, Rusch, Ives Classroom Observation Schedule, designed to identify the complex of teacher and pupil behaviors which contribute to pupil gain in creativity. More specifically, the analysis explored the schedule's objectivity, reliability, and validity in relation to a selected sample of sixth-grade classrooms. Interrelations of pupil gains in creativity with teacher-pupil behavior variables were analyzed.

The sample used. The analysis of the observation schedule was limited to a group of 30 sixth-grade classrooms within a 90-mile radius in a Midwestern state. The classes and teachers were typical of the area. Located in four consolidated school systems, 19 of the classes were in city schools and 11 were in rural schools. Mean I. Q. ranged from 92 to 117. Mean socioeconomic ratings ranged from 3.67 to 5.57 on a seven point scale. Most of the teachers held the B. S. degree and had taught sixth grade an average of 7.33 years. No attempt was made to generalize beyond these 30 classrooms.

Instruments and procedures used. Creativity was measured using a battery of tests prepared for use in the study from those developed by J. P. Guilford. The investigator administered all the pre-tests and post-tests to each of the 30 classrooms. Pre-tests were administered in October, post-tests in April. The tests were scored by four research assistants who had received training for this purpose. The validity of the tests was checked by correlation of each sub-test with a peer nomination and interest inventory administered for this purpose.

The observations were made by a team of three observers. The observers received 30 hours of training prior to the observation visits. Closed-circuit television facilities were used during part of the training period. In an attempt to obtain a random sample of teacher-pupil behaviors, the visits to each classroom were randomly scheduled and unannounced. Three visits were made to each of the 30 classrooms. The three observers worked independently of one another. Three scores for each item of the observation schedule for each classroom visit were obtained.

Statistical analysis. An estimate of the reliability and objectivity of the observation schedule was obtained through the analysis of the observation data. Analysis of variance procedures were used to identify the known sources of variance and to eliminate these from the error variance. Two analyses were conducted. A four-way analysis of variance was used to examine the total schedule variance for mean, first and second order effects. The second analysis consisted of a separate two-way analysis of variance for each item of the schedule. From these analyses coefficients of reliability and objectivity were obtained for the total schedule and for each item of the observation schedule.

The validity of the observation schedule was estimated by comparing the observation scores with pupil gain on the creativity measures. Validity was also estimated by the degree to which the items interrelated in line with the theory utilized in construction of the schedule. A score representing pupil gain in creativity was obtained by using analysis of co-variance to adjust post-test creativity scores for pre-test scores and I. Q. Product-moment correlation and selected contrast comparisons were used to determine the relationship of observation mean scores with adjusted post-test mean scores (gain scores). Cluster analysis and partial correlation were used to examine the interrelationship of observation schedule items in line with the theory utilized in construction of the schedule.

Findings. The objectivity and reliability of the observation schedule was estimated by using analysis of variance to examine sources of variance in the obtained observation scores. These findings are listed below:

1. The total schedule differentiated significantly between classes, observers, items and situations observed.

2. A reliability coefficient of .42 was obtained for the three

recorders and the three situations visited.

3. Classes varied on different items from situation to situation.

4. Most of the variance was attributed to differences between items of the schedule and differences between situations observed. Interactions of observers with situations, items and classes were nonsignificant and the estimate of parameter variance of class and recorder interaction was very low (.016).

5. Item analysis revealed coefficients of objectivity (observer agreement) ranging from .40 to 1.00. Coefficients of reliability of a single score ranged from .15 to .72. Coefficients of reliability of the average score obtained by a classroom for three observers and three visits ranged from .38 to .91. In only one case was an item found to have zero reliability due to its failure to discriminate significantly between classrooms.

6. Inter-correlation of items, coupled with their reliability coefficients, resulted in information which would seem to be valuable in further revision of the schedule. In most cases items correlated positively with one another, which indicated homogeneity. In a few cases very low or negative correlations were indicative of the need to delete or revise items. In at least two cases very high positive correlations may have indicated overlapping items.

7. Predictive validity was estimated by comparing the dependent variable (creativity gain) with the independent variable (teacher-pupil

interaction observation scores). Prior to this comparison a preliminary check on the validity and reliability of the creativity tests yielded correlation coefficients from .67 to .99 for scorer agreement. Split-halves reliability coefficients of from .31 to .79 were obtained for the creativity tests. Low positive inter-correlations of the subtests within the test battery were obtained. In a validity check of the test, low positive correlations of the post-test scores with peer nomination and interest inventory scores were obtained.

8. The validity estimate obtained through the analysis of the relationship of observation scores and adjusted post-test creativity mean scores was complicated by a restricted range of both test and observation scores and by the inconsistency of classes on the creativity tests. Only eight classes consistently differed significantly on the total creativity score and on at least three of the subtests comprising the battery. Originality tests scores were eliminated from analysis due to a restricted range and the highly skewed scores obtained.

9. Gain scores were obtained by adjusting post-test creativity scores through analysis of covariance for initial differences on the pre-test and for differences in I. Q. Since the correlation of socioeconomic status and creativity was very low, status was not used as a covariate. Findings obtained through comparison of adjusted creativity mean post-test scores with mean observation scores are listed below:

a. Generally low, nonsignificant correlations of both negative and positive value were obtained between schedule items and the creativity adjusted means. In come cases significant values were obtained.

b. Gain was not consistent within the battery of tests for a given class. That is, some classes scored high on some subtests and low on others.

c. By examining correlations of observation scores with adjusted mean test scores and making selected contrast comparisons of extreme scoring classrooms for each subtest, it appeared that the Denny, Rusch, Ives Classroom Observation Schedule related positively to pupil gain on the total battery of creativity tests. More specifically, the Classroom Climate dimension did not relate significantly to the Total Creativity gain score, probably because of a significant negative relationship with the Sensitivity subtest score. Classroom Climate did relate positively to the Redefinition gain score. Both the General Structuring and Specific Structuring dimension observation scores related significantly to the Total Creativity gain score for consistently scoring extreme classrooms. More specifically, General Structuring related most positively to classes differing on the Flexibility test, and Specific Structuring related positively to classes differing on the Total test adjusted mean score.

10. Construct validity was estimated by examining the relationship of schedule items to each other and to the theory underlying the schedule construction. Three hypotheses were examined with the following results:

a. H_1--The dimensions of the Denny, Rusch, Ives Schedule are true dimensions (i.e., items are homogeneous within dimensions measuring the same pupil-teacher variable).

This hypothesis was partially supported. The items within the Climate and Specific Structuring dimensions appeared to be homogeneous and more interrelated with items within each dimension than with items within other dimensions. The items within the General Structuring dimension, however, were not homogeneous and, with the exception of two items, appeared unrelated to any of the other items or dimensions.

b. H_2--Classroom climate is considered essential to pupil creative development, without which other dimensions (Teacher Structuring) will be less successful.

c. H_3--With comparable Classroom Climate and General Structuring the higher pupil creativity gain will result in classrooms where Specific Structuring is high.

Hypotheses H_2 and H_3 were not conclusively proved or refuted by a partial correlation analysis. Differences were in the direction hypothesized for the correlation of Teacher Structuring variables with creativity gain scores when Climate was held constant for only the Flexibility and Redefinition tests, thus tending to support H_2. The correlations with Specific Structuring became higher for Total Creativity, Sensitivity, and Redefinition scores when Climate and General Structuring were held constant, tending to support H_3. This direction of change, however, was not so with Fluency and Flexibility mean scores.

Conclusions

For the population tested and within the limits of this study the following conclusions seem warranted:

1. The schedule seems to differentiate between classrooms.

2. The items of the observation schedule seem to measure different aspects of teacher-pupil behavior.

3. The behaviors measured by the schedule seem to differ from situation to situation in a sample of three visits.

4. The schedule appears to be objective owing to a low estimated variance for classes and recorder interaction.

5. Although the error variance is not high, it indicates that other sources of variance are not accounted for in the analysis of the schedule.

6. Increasing or revising the items in the observation schedule and increasing the number of visits might do more to improve the reliability of the schedule than increasing the number of observers, since these factors contributed most of the variance.

7. Although some items may need revision or deletion, in most cases the reliability and objectivity coefficients are equal to or greater than those reported for similar schedules. Elimination of items which correlate at a very low level with other items, and the consolidation of highly correlated, seemingly overlapping items appears to be necessary.

8. In spite of the restricted range of the tests and observation scores it appears that the schedule is valid in differentiating between high and low mean gain classrooms on two of the individual subtests, the tests of Flexibility and Redefinition. When overall trends and comparison of consistently extreme scoring classrooms are utilized, higher observation mean scores are found for high gain classes on the Total creativity test.

Implications and Recommendations

This study is viewed as a preliminary step toward designs for teacher behavior which will effect pupil creative development. The results of this study have yielded a number of conclusions and implications which may provide directions for subsequent research in this area.

1. Further analysis of the Denny, Rusch, Ives Observation Schedule is recommended. Such analysis should use other measures of creativity and other samples of teachers and pupils.

2. The reliability and objectivity estimates are promising. Further revision of the schedule, to eliminate overlapping items and those which seemingly are unrelated to the hypothesized dimensions, should result in higher coefficients of reliability and in increased validity.

3. Lack of significant interaction effects between observers, items, and situations would imply schedule objectivity. Item analysis also indicated acceptable objectivity for most items. The significant differences

between observers seem to imply needed changes in observer selection and training procedures. Since increasing the number of observers would not seem to improve reliability markedly, it would appear wise to reduce the number of observers so that there would be less chance of disturbance in the classroom. By improving observer selection and training, increasing the number of visits and refining the schedule items and dimensions, higher reliability and validity might be obtained with fewer observers.

4. The restricted range of scores seemed to hinder validity estimates in this study. Since the teachers were not receiving instruction in the development of creativity, they tended to teach in the usual manner. This was desired in this study to eliminate the possibility of teaching for the tests, a valid criticism leveled at previous studies. However, as a result, the teachers tended to be very homogeneous and the effect of teacher behavior was random, resulting in small, conflicting pupil gain on the creativity tests. This might be expected in the light of the theory that teachers often practice conflicting and inconsistent roles in the classroom and of the fact that the research indicates little creative development as a result of normal teacher behavior. It is also consistent with research indicating teaching is so complex that no single behavior results in the achievement of a wide variety of goals. In subsequent studies it is recommended that an experimental situation be set up in which some teachers are taught to behave consistently with the schedule dimensions and others

are used as a control. A larger range of scores would be expected in such a situation. An alternative but more expensive plan might be to select classrooms for comparison in widely differing geographical areas.

5. The relationship of the Classroom Climate dimension to creativity development needs further analysis. The seemingly depressing effect of Climate on Total, Fluency, and Sensitivity scores and the negative correlation of Climate with Sensitivity needs examination in light of the positive relationship of the Climate dimension with the other tests of creativity.

6. Item analysis has generated many suggestions for the revision of individual items which should be included in the subsequent use of the schedule.

7. Due to skewed results, the tests of originality included in the battery could not be used in this analysis. Subsequent studies with different pupil populations might not produce such results from these tests. The relationships of schedule items to Originality should be analyzed in subsequent analyses of the schedule, perhaps using other, less restrictive, tests of this aspect of creativity if similar populations of pupils are used.

8. Although limited to design which forbids generalizations beyond this particular sample of classrooms and to noncausal interpretation of observed relationships, the findings of this study imply that teacher-pupil interaction behaviors as categorized in the Denny, Rusch, Ives Classroom Observation Schedule result in pupil creative gain. If further analysis

of this schedule and its use in experimentally designed studies support this implication, strides will have been made toward taking action to educate teachers in those behaviors which will result in pupil creative development.

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APPENDIX

Appendix A

The Denny, Rusch, Ives Classroom Observation Schedule

CLASSROOM CREATIVITY OBSERVATION SCHEDULE

The purpose of this observation schedule is to gather some objective information concerning teacher-pupil behaviors which relate to pupil creative growth.

Revision VIII, February 1966
Indiana University, Bloomington, Indiana

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CLASSROOM CREATIVITY OBSERVATION SCHEDULE

Direction Manual

General Directions

The observation schedule described in this manual is concerned with both verbal and non-verbal behavior of pupils and teachers in a classroom situation. The observer must be aware, therefore, of both the content of the verbal statements made by the teacher and pupils and the physical presence of the teacher and pupils in the classroom. This will necessitate the observer breaking his normal habit of watching the person speaking to also observe the reaction of the person being spoken to. For example, how does the pupil react to a teacher comment or how does the teacher react to a pupil comment? What are the facial expressions; what are the bodily postures which indicate reaction?

Actual physical activities of pupil and teacher are observed. For example, sometimes the teacher might poke the child with a pencil or some other object. At other times the observer might notice the teacher punctuating comments by banging the chalk hard against the board. Or, the observer might find the teacher correcting a child's work. These examples are given here to underline the fact that the observer is concerned not only with the verbal interaction but also the physical interaction of teacher and pupils.

Since the observation schedule is concerned with the development of creativity, the context of a given behavior takes on particular importance in this schedule. The observer must be aware of the content of the lesson as it proceeds and must be able to interpret statements by pupils and teacher in terms of the context in which they are located. For example, a statement of "good" by the teacher takes on one meaning in the context of "put away your books," and another in the context "I would like some original remarks."

Schedule A

For every five minute interval, on each of the four listed dimensions, (motivational climate, variation, convergent-divergent thinking, and initiative), the observer will rate the activities on a five point scale. That is, if the observer enters the room at 2:00, at 2:05 he will place four numbers under period one, each number representing his best judgment of the extent to which that dimension was present during the five minute interval. At 2:10 he will place four numbers under period two, and so on, for the extent of the observation.

Please note, in all four parts of Schedule A a zero code (Code 0) may be used when there is no opportunity to assess. This code would be used for that five minute interval in which the observer cannot infer the situation from the previous time interval. For example, the observer enters the room and finds the class reading or taking a test and the teacher seated at the desk. The observer may reserve the right to change a zero category to one of the scored categories if he should discover, subsequent to the initial zero category, the conditions underlying an activity. For example, the observer might enter the room and find the children working quietly at their seats and the teacher doing nothing to indicate motivational climate. After five or ten minutes the teacher might say "Alright, now you've had a chance to study for the test. We will now put away the books and take the test." This would indicate the motivational climate underlying the prior ten minute interval. The same situation might apply in either of the other categories of Schedule A.

The score for Schedule A is the average obtained by dividing the total by the number of five minute intervals observed.

A. Motivational Climate

We are concerned with the entire classroom situation, how the teacher relates to the pupils and how they relate to him. We are interested in hearing what the teacher says and seeing what he does, whether he is negative or positive in his motivation of the children. A distinction should be made here between negative and positive comments such as "yes" and "no" and derogatory or threatening attitudes and statements. The negative and positive comments are not an issue here. We are concerned with the context in terms of its threat to the child. A negative statement by the teacher can be a positive motivation if it is in such a context. For example, in correcting work a "no" is not threatening if the correcting of the work is in the context of pupil-growth rather than in the context of grades and the threat inherent in grades.

Tests should normally be thought of as threatening. However, the context in which a test is given is an important consideration. For instance, if the tests are used to improve the pupil's work or to show where weaknesses exist and scores or grades are not taken, such as mid-week spelling test or a diagnostic arithmetic test, then a three or four positive category should be checked.

It is important to consider behavior other than verbal in motivational climate. In the instance in which there might be no verbal response but the teacher is smiling, approving, and otherwise indicating encouragement, a positive score could be given or vice versa.

In the cases in which the teacher leaves the room the previous motivational climate is considered to maintain through that interval.

0. No opportunity to assess.
1. Continuous negative motivation-motivation, a continuous factor and at all times negative.
2. Predominately negative motivation-motivation, when used is usually negative but not used at all times.
3. Combination-both negative and positive or neutral motivation used.
4. Predominately positive motivation-motivation, when used is usually positive but not used at all times.
5. Continuous positive motivation-motivation, a continuous factor and at all times positive.

Explanation of Code for Section A. Motivational Climate.

Code 0. - No opportunity to assess.

Code 1. - Continuous negative motivation - This code refers to the time interval in which the teacher uses a continuous and negative approach to motivating children. For example, the teacher may warn pupils of possible punishment (directly or indirectly), future failure, etc.: "If you don't hurry up and get busy you'll all be here next year." "Come to think of it, I have to stay here after school anyway and I would be happy to have you join me." The teacher may express negative motivation by shaking her head negatively, recording names for punishment on the board or in a grade book. No positive motivation is used in Code 1.

Code 2. - Predominately negative motivation - During this time interval the motivational techniques are negative, as those examples above, but spasmodic. For example, the teacher may give an assignment and then make one or two negative comments. Few positive comments are made. Code 2 is different from Code 1 in that there is not as much negative motivation and there can be some positive motivation ("Johnny, you're doing a good job"), however, there will not be as much positive motivation as negative. When there is an equal amount of positive and negative motivation Code 3 is used.

Code 3. - Combination - During this period of time the teacher equally used both negative and positive motivation. For example, there is a direct presentation of the assignment followed with negative and positive comments. ("You may not be able to do this but I'm sure you will try hard!")

Code 4. - Predominately positive motivation - During this time interval the motivational techniques are positive but spasmodic. For example, the teacher speaks of future success of pupils, the teacher encourages by references to self-improvement (growth) and continued progress expected. Failure is referred to as a means of possible growth. Few negative comments may be used, but positive comments are predominant.

Code 5. - Continuous positive motivation - Code 5 is distinguished by no negative motivation. There can be three different situations, however, which could characterize a Code 5 situation:

1. Code 5 could differ from Code 4 in that the teacher is continuously employing a positive motivation in feed-back form to the children. For example, whenever a child makes a remark the teacher responds rewardingly and failure is referred to as a means of growth.

2. The teacher develops self-motivation by having the children plan cooperatively what it is they are to do. Such a planning situation must be observed for the observer to record a Code 5 during the consequent work period.

3. Freedom to explore through a discovery-question approach will positively motivate children. The teacher using the discovery technique will eliminate the need for any direct or indirect reference to progress. The observer would probably not find the teacher rewarding directly with positive statements. However, the observer would find children being challenged and with curiosity aroused they will be self-motivated. ("How can we find out if white objects absorb more or less heat than dark objects?")

B. Variation in Amount of Uniqueness

This dimension is concerned with the amount of uniqueness as opposed to standard use of materials and/or activity of instruction. Although a judgment is involved of whether a given activity and/or material is unique or standard, the dimension is amount or how much uniqueness occurred during the interval. This amount will be judged in terms of time, the number of children involved, and the period of time over which the activity occurs.

A standard use of material or activity is defined as the original purpose or usual use of a device or activity. For example, books are to read; filmstrip - to show to class; tape recording - to listen to or to record reports; overhead projector - to illustrate teacher lectures, etc. Such standard or usual uses of activities and/or materials involve teacher lecture, pupil discussion, pupil work periods and presentation via oral reports, films and filmstrips, recordings or radio. Such activities may involve less than the total class at any one time (small group work, etc.).

A unique use of an activity or material may involve (1) a different use of a particular material (i.e., projecting a filmstrip on a sheet for scenery; using an overhead projector to project original pupil transparencies) or (2) a unique combination of materials and/or activities (i.e., using a tape recording for sound effects while viewing a filmstrip).

In either the unique or standard use of material and/or activity, the use may be completely independent of the dimensions of teacher role in encouraging divergent or convergent thinking; initiative; and motivational climate.

0. No opportunity to assess.
1. Highly standard use-materials and/or activity are conducted in the standard manner for all children.
2. Predominately standard use-a majority of the children are involved in standard use of activity and/or materials for three or more minutes of the interval.
3. Combination-standard and unique activities and/or materials are equally mixed for a majority of the children during the interval.
4. Predominately unique use-a majority of the children are involved in unique use of activity and/or materials for three or more minutes of the interval.

5. Highly unique use-materials and/or activity are conducted in a unique manner for all children.

Explanation of Code for Section B. Variation in Amount of Uniqueness.

Code 0. - No opportunity to assess.

Code 1. - Highly standard use-describes that interval of time in which all activities and/or materials of instruction are being used in the usual standard manner. For example, children are reading, writing, viewing a filmstrip or making a tape recording. Such activities and use of materials of instruction may be for the total class or sub-groups and individuals-but in the total room, during this interval, no activity or material of instruction is being used in a unique manner as described in Code 5. A continuous example will be used to illustrate variation in amount of uniqueness. Choosing social studies as an example content area, Code 1, highly standard use, would mean observing children discussing their reactions to a current events issue recently heard over the classroom radio.

Code 2. - Predominately standard use-This differs from Code 1 in that, although the predominate use of materials and/or activities of instruction for the majority of the class and for more than half of the interval (3 min.) in the usual manner, a few cases of uniqueness can be observed during this interval of time. This might refer to a five minute interval during which the majority of the class (all but one or two individuals) are participating in a usual use of activity and/or material (i. e., class reading) while one or two children use the filmstrip machine in the corner of the room. It could also describe an interval in which at least three of the five minutes were devoted to the usual use of the activity or material for the total class with the remaining time being a unique use. To refer to the continuous example, Code 2 predominately standard use, would describe the class discussing the current events issue for most (3 min.) of the time interval, but then role playing the next steps or the event itself as a follow-up of the discussion.

Code 3. - Combination-This code refers to the interval of time in which both usual and unique use of materials and/or activities takes place for the majority of the class, so that the observer cannot determine a preponderance of either one.

In the continuous example we might find both discussion and a tape recording of the current events incident being used simultaneously so we cannot say if unique or standard use of activity and/or material were used. It could also describe the situation in which equal numbers of students are involved in both unique and standard activities.

Code 4. - Predominately unique use-Code 4 defines the period of time in which it is evident that the majority of the interval (3 min.) and the majority of the class is using an activity and/or material of instruction in a unique manner. For example, in arithmetic, while some write answers to examples (standard), the majority of the class write original examples or construct demonstration devices (unique). The continuous example might find a group of children presenting the current event to the class as a "T. V." report in which the tape recording, supplemented by pictures serve as "props" in their dramatic presentation. A discussion follows.

Code 5. - Highly unique use-During this time interval all of the materials and/or activities of instruction are unique. The total class or individuals and groups might be employed in this manner. For example, (1) The usual use of the overhead projector is for teacher use in lecturing to the class. A unique use would be pupils constructing transparencies for their oral report to the class. (2) Materials and/or activities might be combined in various unique ways, such as a filmstrip machine projecting on the rear of a sheet screen while children present pantomime in front of the screen as a social studies or science report. In the continuous example we might find the same activity as that described in Code 4 except that the total interval would be employed with the "T. V." report. Or, in addition to the report, rather than the standard discussion, the teacher might have the class act as the adults effected by hearing the "T. V." news report and record their "man-on-the-street" reactions on tape to be later shared with the total class.

C. Teacher Role in Encouraging Convergent and Divergent Thinking

The distinction in this item is between divergent and convergent thinking on the part of pupils. By convergent is meant moving toward the accepted or correct, a response that all can agree upon. By divergent is meant a response which is not necessarily the one right answer, a response which is original, a response situation in which there is more than one answer which is suitable. The key in observing this category is the type of questions the teacher asks the children and the kind of subject matter being utilized. If the teacher is asking the children questions which are specific and which have one right answer this would be of a convergent nature. If the teacher is asking the children to think of something on their own in an open-ended way, such as asking them what their opinion is or allowing them to speculate, we would be seeing something at the divergent end of the scale. In some cases the teacher may, by his selection of content, provide divergent thinking through the stimulation of the child's imagination. For example, the reading to the class of an imaginary story would be a case in which the teacher by selecting a stimulating story is exciting the imagination of the class. Another example would be the situation in which the class is allowed to read library stories of their own choice without specific assignments to look for facts in these books. This would be another example of the divergent end of the scale. Occasionally the observer will find originality being directly and specifically encouraged. This could be in mathematics where different ways of solving problems are requested or in the area of language arts in which creative writing is being done.

0. No opportunity to assess.
1. Primary convergency-teacher allows only convergent thinking.
2. Encouraged convergency-teacher permits a little divergent thinking while encouraging convergency.
3. Equal divergency-convergency-teacher allows both convergent and divergent response favoring neither.
4. Encouraged divergency-teacher encourages divergent thinking in alternation with convergent.
5. Primary divergency-teacher's main purpose is divergent thinking.

Explanation of Code for Section C. Teacher Role in Encouraging Convergent and Divergent Thinking.

Code 0. No opportunity to assess.

Code 1. Primary convergency - Code 1 describes the time interval in which the purpose of the lesson is strictly information presentation and intake. A variety of the following methods and materials may or may not be used. In any case there is no opportunity for children to produce original ideas although they may participate in a discussion to ask questions clarifying information or may present information themselves such as a report on material they have previously gathered. Emphasis in all cases is on the correct or accepted answer or solution. Only convergent thinking is allowed.

For example:
(1) children are reading independently or as a total class to find information.
(2) children are listening to the teacher tell them information.
(3) children are viewing a filmstrip or motion picture without discussion of implications, possibilities, etc.
(4) using maps, charts, etc., to convey information.
(5) use of opaque projector, overhead projector, tape recorder or disk recorder to present information.
(6) children are presenting learned facts, correct answers, etc.

Code 2. - Encouraged convergency-Although encouraging convergent thinking, the teacher allows departure from any of the above activities of information presentation and intake to ask or allow a child to express his opinion, to speculate as to cause or possible result, etc. Divergent thinking is allowed but not encouraged. During all such departures the teacher dominates the discussion and allows only limited ideation on the part of the child or may simply ignore divergency without comment. The teacher may cut off the pupil response and insert a value statement regarding the pupil response-accept or reject the response.

Code 3. - Equal Divergency-Convergency-Code 3 differs from Codes 2 and 4 in that the teacher allows both divergent and convergent ideation. The teacher responds similarly to both convergent and divergent thinking. Each kind is encouraged and discouraged equally.

Code 4. - Encouraged divergency-Code 4 describes that period of time in which the teacher purposely encourages and provides time for divergent thinking with convergent thinking (information gathering and idea production). For example, after presenting information, the teacher encourages pupil speculation of possible results and action found in the information gathered, implications, improvements, etc. The teacher might ask the children to write original stories or essays about information gathered, draw pictures to illustrate meaning, make a mural or create a play to illustrate meaning of information presented. In arithmetic, the teacher might ask for other ways of finding the solution to a problem or example. Code 4 thus describes teacher variation of purpose in which a lesson is planned to proceed from information gathering to idea production in an alternating process. Convergent thinking is allowed but not encouraged.

Code 5. - Primary divergency-Code 5 describes that period of time in which the teacher's sole purpose is provision for pupil development of ideas. It differs from Code 4 in that the primary purpose is idea production. Where in Code 4 an alternating process of information gathering (convergent) and idea production (divergent) might be observed during a given five minute interval, in Code 5 we find only divergency during the interval.

For example:

(1) the teacher encourages the children to analyze-to pull apart the whole to study how it became that whole.
(2) experiences are provided for children to put an object or objects into different uses than those commonly known.
(3) chances are given to experiment with a wide variety of materials or bits of information to produce, or work toward a final original result.
(4) children are encouraged to be original in discussing how to go about doing something (i.e., how to build a model farm; how to set up an experiment).
(5) an art or music experience in which children are encouraged to freely express their ideas.
(6) a creative writing experience in which children are encouraged to express their own ideas on paper.
(7) a situation in which groups of children are encouraged to produce group products which are original (i.e., construction of a mural or bulletin board, preparing a dramatic production, preparing original ways to present a report).

D. Pupil Initiative in Control of Instruction

The focal point of this category is pupil-control of instruction. Concern here is the degree to which the pupil is able to participate in controlling the content, speed, direction or method of instruction. Occasionally this will be found as a result of a direct act on the part of the teacher. For example, the teacher might say:: "You may decide which books and materials you wish to use to answer these general questions." However, in most instances pupil initiative will be exerted during a discussion or work period. In these cases the direction can be altered by children volunteering information and by the teacher accepting the volunteered information or responding to the information to answer questions and thus causing side-tracks in the flow of the lesson. Sometimes a whole lesson is composed of numerous side-tracks. This would be volunteered information that is not from the textbook or directly in the content of the lesson. In these cases, by virtue of pupil response, the actual content, speed, and direction of the lesson is determined in large part by the pupil. This can also be seen during a work period. When a child asks for help he is controlling the type, speed, and direction of content for himself. In cases in which a teacher, during a work period, goes to children who are not asking for help, we would have a situation which is more teacher controlled than pupil controlled. This would also be the situation in a discussion if the teacher is only calling on pupils and not responding to those who volunteer information or questions. In either of these cases, however, (work or discussion) if the teacher elaborates on or spends time with a pupil to whom the teacher first responded without the pupil volunteering, this could well become a situation in which the pupil's reaction is controlling the content.

The observer must be careful to identify situations in which pupils are volunteering information but in which the teacher is not accepting the information or is ignoring it without comment and proceeding with a pre-planned lesson. These cases are different from those previously described.

0. No opportunity to assess.
1. Teacher domination-no pupil participation.
2. Teacher domination-minor pupil participation.
3. Teacher control-major pupil participation.
4. Pupil control -teacher participation.
5. Pupil control-no teacher participation.

Explanation of Code for Section D. Pupil Initiative in Control of Instruction.

Code 0. - No opportunity to assess.

Code 1. - Teacher domination-no pupil participation. This code applies to a situation in which the teacher is exercising autocratic control and little or no opportunity is provided for pupil participation in control of the situation. That is, all activities are dictated by the teacher. Some examples of this are:

(1) Teacher announces assignment, test, or work plan.
(2) Teacher presents learning content.
(3) Teacher recites correct answers to written work.
(4) Pupils recite, work at board, etc., as designated by teacher.
(5) Pupils give a teacher-assigned report.

Code 2. - Teacher domination-minor pupil participation. This code applies to a situation in which the teacher is exercising major control, but pupil questions and suggestions are taken into account and used to direct activities to a limited extent. Examples of this are:

(1) Pupils recite, work at board, etc., after having volunteered.
(2) Pupils raise questions regarding subject matter or procedure after teacher asks for same.

Code 3. - Teacher control-major pupil participation. This code is used for a time interval during which the teacher is controlling the general situation, but pupil initiative is permitted to exert a great deal of control over specific content and activities. That is, the teacher plans the overall structure of the type of learning which is to take place but is sensitive to pupils' needs, suggestions, questions, and planning to determine specific details. An example of this is the situation in which the teacher announces the topic for study and then lets the students plan how the topic should be attacked. Another example is a class discussion period in which a teacher-assigned subject is discussed but where control over the content and activities of the assignment is in the pupils' direction. Still another situation of this type is one in which the teacher makes a general assignment, and students study whatever material they feel applies to the assignment.

Code 4. - Pupil control-teacher participation. This code is used for a time interval during which the students have almost complete control of the learning situation, and the teacher is merely acting as one of the group. This applies to a pure activity-type program in which the pupils are choosing their own activities and proceeding as they see fit, with only occasional guidance from the teacher. It also applies to a period in a more traditional type school in which the pupils are given control of the class. For instance, Code 4 is used if some pupil spontaneously suggests that the class have a party, provide a Christmas basket for a poor family, or some similar activity, and then the teacher lets them proceed with implementing the suggestion.

Code 5. - Pupil control-no teacher participation. This code applies to all situations of extreme pupil-control, with no participation by the teacher. The pupils, of course, never have complete control, for at any time it may be a teacher's decision to permit students more or less independent choices on what they do. This is frequently the case at "recess", where there is no organized or supervised activity. Although recess is not covered in classroom observation, similar situations sometimes occur in classrooms. An example is more or less "free activity" of a class preparing for a Christmas play or a dramatization in connection with the study of literature.

Schedule B

This part of the schedule is recorded at the end of each ten minute period for the time interval preceeding as follows: When one of the listed behaviors characterizes the preceeding ten minute period, the observer places a mark on the positive or negative side of the score sheet. Tally only once during the ten minute interval for any given behavior. This schedule is used only when the behavior is very obvious for at least a quarter of the class in the case of parts A and C which refer to pupil behavior. That is, when everyone would agree that many students were "eager" because of their remarks, that the teacher was "inattentive" because of her response, that the remarks of the pupils were "courteous" or "rude", etc.

The score for Schedule B is the average difference. This is obtained by dividing the difference score obtained by totaling the positive and negative tallies by the number of ten minute intervals observed.

A. Pupil-Teacher Relationship

Positive	Negative
1. Responded eagerly in recitation.	1. Were reluctant to recite, did not volunteer.
2. Worked intently with little sign of attention wandering (work period).	2. Were restless, gazed about, doodled, daydreamed.
3. Were prompt in taking part in activities (work period).	3. Were slow in responding to teacher's request.
4. Paid close attention to teacher or other pupil.	4. Whispered or showed other signs of inattention.
5. Made courteous remarks.	5. Made rude remarks.
6. Received teacher criticism in a positive manner.	6. Were quarrelsome, irritable in response to teacher criticism.

B. Teacher-Pupil Relationship

It is important to note that the teacher response to pupils applies not only in discussion situations but also in work periods. If the teacher ignores the children during the work period, busying himself at his desk or on some project unrelated to what the children are doing, a negative score would be tallied.

Positive	Negative
1. Teacher responded positively to pupil contributions.	1. Teacher responded abruptly and negatively to pupil contributions.
2. Teacher used "we" approach in talking to children	2. Teacher used "I" approach in talking to children.
3. Teacher was attentive to pupil remarks.	3. Teacher spoke to other children, cut off child speaking or was otherwise inattentive to pupil remarks.
4. Teacher asked opinion of child not volunteering information (not raising his hand for help or to give information).	4. Teacher acted upon the advice of a few children-not involving all concerned in discussion.

C. Pupil-Pupil Relationship

Positive	Negative
1. Children refer (or otherwise indicate) positively to success of others.	1. Children refer negatively to success of others.
2. Children share responsibility within the classroom.	2. Children are reluctant to share responsibility within the classroom.
3. Children accept without comment or other overt action differences in individual capability.	3. Children make fun of or speak about others because of difference in capability.
4. Children express appreciation of classmates unusual or different response.	4. Children make derisive comments or laugh at unusual and different responses of classmates.

D. Teacher Group Approach

It should be noted that the items in this section may refer to "phases" or a section of the lesson being observed. For example, in a given lesson there might be a number of introductions to some parts of the lesson.

Positive	Negative
1. Teacher introduction to activities sets off pupil interests.	1. Teacher introduction does not build pupil interest.
2. Teacher responds to pupil questions and comments to further the lesson being taught.	2. Pupil comments and questions do not influence course of the lesson.
3. Teacher responds to pupil reaction to lesson to slow, speed, or otherwise alter presentation.	3. No attempt made to vary lesson to meet the needs of the class as shown by their overt reactions.
4. Materials used are ready for immediate use.	4. Materials of instruction are not ready for immediate use.

5. Children are actively involved at high point of interest.	5. Children are actively involved at a point after interest at its peak.
6. Teacher concludes the lesson while interest still holds.	6. Conclusion of lesson comes after children appear to be restless.

Schedule C

A. Teacher Allowance for Individual Differences

"Teacher Allowance for Individual Differences" would be unduly inflated if tallies were made for situations in which the teacher is calling on pupils to record grades, or calling pupils to the board, or conducting an oral quiz. These situations should be eliminated from the tallying for this part of Schedule C.

The score for Schedule C is called the differentiation index. This is obtained by dividing the number of different individuals with whom the teacher spent time (CA1) by the total number of pupils present and multiplying this by the number of times the teacher differentiates (CA2). This is then divided by the number of minutes observed. This score thus indicates the proportion of pupils differentiated for as related to the total number present and the number of minutes observed.

Differentiation index = (CA1 ÷ Pupils Present x CA2) ÷ Minutes Observed

1. Number of Different Individuals With Whom the Teacher Spent Time

This should not be construed to mean the number of different groups with whom the teacher spent time. If the teacher is giving directions to a group of 10 students, he is spending no time with individuals according to the meaning of this category. However, if one student asks a question and the teacher answers it, this is recorded as one (1) individual with whom the teacher has spent time.

2. Number of Times Teacher Differentiates for Individuals

Unlike item one, this refers to the number of times the teacher differentiates, not the number of different students. She may stop five (5) times in the course of the observation to help a single child. Item one will tell us this was one child.

item two will tell us she spoke to him five times.

B. Teacher Encouragement of Unusual Responses

Record here the tally of times the teacher encourages unusual responses. Encouragement may be verbal or non-verbal (i.e., smiling or laughing appreciatively). It should be noted that unusual responses may be either of a direct or indirect type and the teacher encouragement may also be direct or indirect. Examples of direct encouragement of direct, unusual responses are: "That was a very good answer, George, it was an idea no one else thought of!"; "Can we have some original ideas?"; "Let's see how many new ways we can think of for doing this." The observer must beware of teacher use of sarcasm and record only obviously genuine teacher encouragement of unusual responses. In the case in which the teacher has asked for unusual responses and then rewards these responses with brief comments such as "good", "fine", or a smile or nod of the head, these brief rewards in this context would also be tallied as encouragement of unusual responses. An example of indirect unusual response would be a situation in which a child produces an unusual response in the midst of a discussion or situation in which usual responses are the norm and the teacher approves of his unusual response and rewards him positively for it in an indirect manner rather than squelching this response. For example, the class might be discussing current events and the child might make an unusual suggestion about solving an international problem. The teacher could reward this response by approving of it.

Schedule D

A. Variation in Amount of Activities and/or Materials of Instruction Used

The purpose of this schedule is to tally the number of different kinds of activities and/or materials of instruction being used during the observation period. A slightly different procedure is used for this schedule. Here, all the activities and materials are listed on the observation schedule and are merely checked at the time they are observed to occur. The activity or material should be tallied only once during the observation. It is not necessary to indicate the number of times the activity or material was used. The score is the total number of different activities and/or materials of instruction used during the observation period.

B. List of Activities and/or Materials of Instruction

1. Blackboard
2. Charts, Maps
3. Decorate Room
4. Discussion (as opposed to Oral Quiz, must have interaction between pupils)
5. Discussion Groups (any group work such as math group, reading group, etc.)
6. Draw or Paint
7. Movie, Slides
8. Oral Quiz (any situation without pupil-pupil interaction and where response of pupil does not divert situation but where the teacher is simply firing questions at the children)
9. Other Books (when at least a quarter of the class are using such things as dictionaries, encyclopedias, library books, etc.)
10. Other Problems (where pupils or teacher contribute to the lesson from memory, experience, or ideas to add to or clarify something in addition to the lesson or text)
11. Other Room
12. Pupil Constructs (pupils actually working on at time of observation)
13. Pupil Experiment
14. Pupil Report
15. Read Aloud (not including situations in which only a sentence is read, but where a whole section from the book is read either by pupil or teacher)
16. Role Play
17. Teacher Demonstration (limited to teacher demonstrations of how to do something as opposed to demonstrations as part of a lecture)
18. Teacher Lecture
19. Test
20. Text-Seat (differentiated from Workbooks)
21. Trip
22. Workbooks (could include ditto sheets or workbook pages)
23. Pupil Papers (correcting, working on, or reciting from papers)
24. Other (list) ____________
25. ____________
26. ____________

CLASSROOM CREATIVITY OBSERVATION SCHEDULE

Teacher ____________________ **Gd.** __________ **Subject Area(s)** ____________

____

____

Rater _________ **Date** _________ **From** ______ **To** ______ **Total Min.** __

Schedule A

5 Minute Periods

	1	2	3	4	5	6	7	8	9	10	11	Total	Ave.
A. Motivational Climate													
B. Variation													
C. Divergency													
D. Initiative													

Schedule B -

		Frequency			Total	Ave. Diff.
A. Pupil-Teacher Relationship	+					
	-					

		Frequency			Total	Ave. Diff.
B. Teacher-Pupil Relationship	+					
	-					

		Frequency			Total	Ave. Diff.
C. Pupil-Pupil Relationship	+					
	-					

		Frequency			Total	Ave. Diff.
D. Teacher Approach	+					
	-					

Schedule C

Total Pupils Present ________ Differentiation Index ________

A. Teacher allowance for individual differences

1. Number of different individuals with whom the teacher spent time
   Tally ______________________________ Total ______________
2. Number of times teacher differentiates for individuals
   Tally ______________________________ Total ______________

B. Teacher encouragement of unusual responses

Tally ______________________________ Total ______________

Schedule D

A. Variation in Amount of Activities and/or Materials of Instruction Used

Material or Activity

1. Blackboard ____________________
2. Charts, Maps ____________________
3. Decorate Room ____________________
4. Discussion ____________________
5. Discussion Groups ____________________
6. Draw or Paint ____________________
7. Movie, Slides ____________________
8. Oral Quiz ____________________
9. Other Books ____________________
10. Other Problems ____________________
11. Other Room ____________________
12. Pupil Constructs ____________________
13. Pupil Experiment ________
14. Pupil Report ____________
15. Read Aloud ____________
16. Role Play ______________
17. Teacher Demon. ____________
18. Teacher Lecture ____________
19. Test ______________
20. Text-Seat ______________
21. Trip ______________
22. Workbooks ______________
23. Pupil Papers______________
24. Other (list)______________

Appendix B

Rationale and Description of the Creativity Tests

Although the Guilford tests have been only moderately successful in validation with external criteria[1] they continue to show power to differentiate in factor analytic studies.[2] As a result they play a major role in the tests (tasks) developed by Torrance and others.[3] The major problem in the comprehensive task type tests as developed by Torrance is that test scoring becomes highly subjective. Although the desirability of an enlarged scope for test tasks is recognized, since research indicates general creativity is rare,[4] limitations of time, expense, and the age of the child involved in this study limit the assessment of the dependent variable to that of the separate factor test.

Five basic aspects of creativity have been identified and modified through the research of Guilford. These aspects are Originality, Sensitivity, Fluency, Flexibility, and Redefinition.[5] It is interesting to note that sensitivity to problems may also be a characteristic of the noncreative, but the creative person not only senses the problem but goes on to solve it.[6]

The tests and the factors they measure which have been included in the battery for this study are described below:

1. Ideational fluency is measured by the Consequences test.[7] Ideational fluency, the ability to evoke a large number of ideas in meaningful context, was selected rather than associational, word, or expressional fluency, since it seems

to be more practical in that it concerns ideas in the relevant context of a problem to be solved. The test was used in the previous pilot study,[8] and revised editions for sixth and seventh grades are available.[9]

2. *Spontaneous flexibility* is measured by the Alternate Uses test.[10] Spontaneous flexibility represents the notion of set or set breaking, the ability of the subject to think flexibly. It represents the ability to produce a variety of class ideas. Adaptive flexibility, the ability to produce a variety of transformations when the subject must be flexible in order to solve the problems, was not used in the battery, since it appears to closely relate to redefinition. The Alternate Uses test is available with sixth grade norms and reliability coefficients.[11]

3. *Redefinition* is measured by the Gestalt Transformation test. It involves the production of transformations of a unique variety. It also involves the changing of functions or uses or parts of one unit and giving them new functions or uses in some new unit.[12] Semantic, rather than figural or symbolic, redefinition is included in the battery. The pilot study revision of this test for sixth graders is used.[13]

4. Originality is measured by part of the Consequences test and by the Plot Titles[14] test. Originality involves adaptive flexibility with semantic material where there is a shifting of meanings. The subject must produce shifts or changes in meaning to provide novel, unusual, or uncommon clever or remote ideas.[15] Thus, originality can be ascertained by utilizing measures of uncommonness of response (statistically infrequent for the population), remoteness-of-association (number of remote as compared with common), and cleverness (as rated by judges). The aspects of remoteness and cleverness will be measured by the tests in question. The number of remote responses will be determined from the Consequences test, and the Plot Titles test will yield a score of cleverness as rated by a skilled judge for both pre-testing and post-testing. This type of rating has been shown to relate significantly to the factor of originality.[16]

5. Sensitivity to problems is measured by the Problems Test.[17] Sensitivity is an evaluative task related to implications. Being able to see defects or deficiencies results in the evaluation of semantic implications. The number of problems which deal with the structure, use, or operation of the object becomes the sensitivity score.

FOOTNOTES

[1] Taylor, Calvin W., Creativity: Progress and Potential, New York: McGraw-Hill, 1964, p. 35.

[2] Guilford, J. P.; Merrifield, P. R.; and Cox, Anna B., "Creative Thinking in Children at the Junior High School Levels," in Report of the Psychological Laboratory, no. 26, pp. 1-35, University of Southern California, Los Angeles, 1961.

[3] Taylor, op. cit., pp. 82-83.

[4] Guilford, J. P., "Factors That Aid and Hinder Creativity," Teachers College Record 63:387, February, 1962.

[5] Ibid., p. 121.

[6] Ibid., p. 387.

[7] Christensen, P. R.; Merrifield, P. R.; and Guilford, J. P., Consequences, Beverly Hills, Calif: Sheridan Supply Co., 1960.

[8] Rusch, Reuben; Denny, David; and Ives, Sammie, "Fostering Creativity in the Sixth Grade," Elementary School Journal 65:262-268, February, 1965.

[9] Christensen, Merrifield, and Guilford, op. cit., Manual, p. 5.

[10] Wilson, R. C., and others, Alternate Uses, Beverly Hills, Calif: Sheridan Supply Co., 1960.

[11] Ibid., Manual, p. 2.

[12] Guilford, J. P., "Three Faces of the Intellect," The American Psychologist 14:469-479, August, 1959.

[13] Rusch, Denny, and Ives, op. cit.

[14] Wilson, R. C.; Guilford, J. P.; and Christensen, P. R., "The Measurement of Individual Differences in Originality," Psychological Bulletin 50:362-370, November, 1953.

[15] Guilford, "Three Faces of the Intellect," op. cit., pp. 469-479.

[16] Wilson, Guilford, and Christensen, op. cit., pp. 362-370.

[17] Guilford, J. P., Seeing Problems EM101, Experimental copy obtained from the author, no date.

Appendix C

Pupil and Observation Data

TABLE 26. SUMMARY OF CLASS MEANS AND STANDARD DEVIATIONS FOR PUPIL PRE-TESTS OF CREATIVITY

Class	N	Redf	S. D.	Flex	S. D.	Orig C	S. D.	Sensi	S. D.	Orig R	S. D.	Flu	S. D.	Total	S. D.
1	35	4.71	2.67	4.82	3.35	1.08	1.70	13.77	5.59	1.28	1.72	7.42	4.62	33.17	14.40
2	26	5.19	1.91	9.03	3.93	1.61	2.71	18.80	5.01	0.73	1.15	8.80	3.00	44.19	12.35
3	25	7.56	2.81	7.80	3.30	1.68	2.13	15.80	4.28	1.00	0.91	8.28	3.39	42.12	9.68
4	25	5.52	2.51	6.56	2.31	1.36	1.80	14.48	4.44	3.56	3.34	11.88	6.35	43.36	3.06
5	27	5.14	2.03	7.33	5.06	1.03	1.50	18.33	5.70	1.29	1.23	9.85	4.67	43.00	14.45
6	31	4.96	2.45	5.25	3.20	0.83	1.12	14.38	3.87	0.77	0.95	9.54	4.36	35.77	11.35
7	32	6.00	3.26	6.75	3.37	1.12	2.09	15.90	3.56	1.21	1.43	9.50	3.95	40.50	12.19
8	30	6.20	2.91	6.10	3.48	1.00	1.46	16.13	3.94	1.26	1.31	6.23	2.55	36.93	9.26
9	12	6.66	2.80	4.75	4.28	0.33	0.77	18.33	4.79	0.33	0.42	8.41	2.50	38.83	10.66
10	33	5.42	2.72	5.39	3.71	0.90	2.29	16.06	4.90	1.27	1.48	8.15	4.29	37.36	12.94
11	30	5.06	2.18	4.06	3.44	0.46	1.00	13.63	6.27	0.50	0.97	8.46	5.09	32.20	14.48
12	27	5.18	2.76	4.66	3.54	0.51	1.18	13.66	5.73	1.00	1.17	9.00	4.08	34.03	14.12
13	34	6.55	2.56	6.14	4.56	0.58	1.35	15.29	6.42	0.79	1.29	7.05	3.15	36.41	14.16
14	33	6.15	2.72	5.96	3.71	0.84	1.80	15.00	5.30	0.93	0.96	7.75	3.57	36.69	13.39
15	33	4.78	2.02	5.06	3.74	0.12	0.48	16.30	5.37	0.60	1.19	7.21	4.02	34.57	13.00
16	35	6.42	2.48	5.45	4.13	0.28	0.85	15.22	4.97	0.65	0.83	7.65	3.86	35.42	12.92
17	31	5.96	2.44	6.32	4.64	0.32	0.90	16.45	5.18	0.90	1.04	9.77	3.71	41.09	16.18
18	28	5.89	2.31	5.14	3.58	0.21	0.83	15.07	5.75	0.64	0.95	6.03	3.44	32.64	12.31
19	28	5.14	2.46	4.00	3.37	0.14	0.52	15.60	4.63	0.85	1.07	11.07	4.00	37.14	11.00
20	28	4.75	2.15	3.60	2.67	0.00	0.00	12.32	5.34	0.46	0.63	5.96	2.71	27.14	8.68

TABLE 26 (Continued)

Class	N	Redf	S. D.	Flex	S. D.	Orig C	S. D.	Sensi	S. D.	Orig R	S. D.	Flu	S. D.	Total	S. D.
21	15	6.40	3.22	8.33	3.33	1.33	2.35	16.53	5.84	0.60	0.82	10.33	3.41	42.86	11.96
22	41	3.92	1.96	2.56	2.81	0.24	0.79	12.46	4.17	0.90	1.26	7.43	3.68	27.53	10.16
23	26	5.19	2.95	5.19	3.73	0.38	0.80	15.50	6.05	0.61	0.94	6.65	3.50	33.53	13.05
24	33	4.42	1.87	4.90	3.07	0.54	1.14	14.06	5.18	0.57	0.96	6.27	3.77	31.09	11.02
25	38	5.71	2.31	8.02	4.35	1.10	1.44	16.07	5.09	1.78	1.93	9.65	3.18	42.36	12.85
26	36	6.02	2.70	6.27	4.37	0.88	1.81	17.41	6.65	1.25	1.66	9.97	4.55	41.83	16.35
27	33	5.63	2.34	5.21	3.37	0.30	0.88	16.06	5.19	0.93	1.19	9.24	3.80	37.39	9.76
28	32	6.87	2.21	7.28	4.62	0.62	1.38	15.62	5.33	1.53	1.26	9.84	4.12	40.40	13.00
29	24	4.33	2.51	5.08	4.29	0.66	1.27	10.75	4.99	0.70	1.08	6.45	3.50	28.00	13.48
30	38	3.36	1.89	4.10	3.15	0.26	0.82	12.31	5.19	0.73	1.32	5.13	3.05	25.92	9.69

TABLE 27. SUMMARY OF CLASS MEANS AND STANDARD DEVIATIONS FOR PUPIL POST-TESTS OF CREATIVITY

Class	N	Redf	S. D.	Flex	S. D.	Orig C	S. D.	Sensi	S. D.	Orig R	S. D.	Flu	S. D.	Total	S. D.
1	35	6.11	2.51	8.40	3.73	1.31	1.87	16.57	4.66	2.11	2.21	9.71	4.70	44.22	14.70
2	28	7.78	1.95	10.89	3.55	1.57	2.13	17.67	4.64	1.89	1.79	9.89	3.99	49.71	12.14
3	28	7.32	3.30	9.67	4.17	1.42	1.87	16.35	5.02	3.25	1.77	10.78	3.90	48.92	12.64
4	26	7.00	3.14	9.07	3.75	0.69	1.49	19.46	4.71	3.34	2.69	11.80	3.89	51.00	13.15
5	27	7.18	3.22	8.51	4.94	2.37	2.42	18.55	5.25	3.62	3.16	12.03	5.15	52.29	17.74
6	30	7.03	3.55	9.03	4.20	1.93	1.77	16.10	4.43	2.83	2.36	9.96	4.48	46.90	14.65
7	30	8.23	3.64	10.46	3.98	2.33	2.23	18.16	4.60	2.50	1.77	12.46	4.02	53.86	13.04
8	24	8.79	3.38	8.87	3.80	2.16	2.69	14.91	3.06	3.16	2.44	10.00	4.06	47.87	12.93
9	11	7.36	2.15	7.27	3.00	0.18	0.60	18.27	5.88	1.54	1.36	9.63	5.08	45.90	13.77
10	32	6.43	2.75	7.75	4.12	1.75	2.81	18.40	4.85	3.25	2.91	12.12	5.22	49.71	16.82
11	30	5.73	2.58	7.20	4.79	1.13	1.71	13.70	5.87	2.76	2.43	9.96	4.54	40.50	17.31
12	27	5.55	2.48	8.37	4.04	1.33	1.75	14.92	7.46	3.25	2.73	10.66	5.29	44.11	17.89
13	32	6.68	2.81	8.93	4.47	1.06	1.75	19.46	5.61	2.84	2.45	11.00	5.18	50.96	18.38
14	35	7.34	2.93	8.14	3.48	1.94	2.72	19.14	6.36	2.31	1.81	13.17	4.96	51.94	18.14
15	36	5.72	2.68	8.44	5.05	1.50	2.45	17.86	5.09	1.97	2.34	10.41	5.33	45.91	18.25
16	36	7.58	3.37	10.05	5.14	1.50	2.54	18.63	5.17	2.16	1.82	12.16	4.78	52.11	17.16
17	31	7.58	3.59	8.61	5.02	1.80	2.21	17.90	6.72	1.87	1.83	12.83	5.72	50.61	19.23
18	28	6.92	3.23	7.92	4.74	0.92	1.84	16.32	5.90	4.00	3.29	12.03	5.25	48.14	20.12
19	27	6.44	2.86	6.66	4.66	0.37	0.79	16.92	5.90	2.70	2.01	13.11	4.20	46.22	15.59
20	27	6.48	2.42	6.85	3.61	0.29	0.72	14.66	5.06	1.81	1.84	8.96	3.82	39.11	12.11

TABLE 27 (Continued)

Class	N	Redf	S. D.	Flex	S. D.	Orig C	S. D.	Sensi	S. D.	Orig R	S. D.	Flu	S. D.	Total	S. D.
21	15	8.60	2.55	12.53	3.15	2.93	3.01	20.00	4.70	3.20	2.21	12.80	4.69	60.06	11.86
22	39	5.61	2.49	5.02	4.23	0.56	1.29	13.38	4.97	1.05	1.16	7.82	3.59	33.20	13.45
23	28	7.00	3.43	7.85	4.39	0.42	0.99	16.03	4.91	1.67	1.96	8.53	4.47	41.42	14.84
24	36	5.77	1.97	8.30	3.67	1.66	1.68	17.25	5.44	1.69	1.50	10.58	4.69	44.77	13.89
25	37	8.00	2.40	9.48	4.03	2.10	2.40	16.18	5.11	2.13	2.09	12.97	5.25	50.89	16.46
26	33	7.03	3.57	11.00	6.03	1.87	2.11	19.60	4.86	3.57	3.34	12.84	5.60	56.06	19.95
27	32	6.37	2.09	9.84	3.71	1.31	1.65	18.00	4.39	3.21	2.57	13.81	4.15	52.87	12.41
28	37	8.45	2.81	12.48	5.33	2.27	2.41	18.78	5.05	2.83	2.55	11.29	5.86	56.10	17.84
29	24	6.12	2.67	8.12	4.89	1.16	1.94	11.45	6.97	1.62	1.61	8.16	4.91	36.66	17.50
30	36	5.61	2.10	6.75	3.66	1.16	1.74	14.47	4.37	1.16	1.23	8.61	3.65	37.72	10.95

TABLE 28. SUMMARY OF CREATIVITY TEST DATA FOR PRE-TESTS AND POST-TESTS (N = 898 pre, N = 896 post)

Test	Mean	S. D.	Maximum	Minimum	Range
PRE-TESTS					
Redefinition	5.44	2.59	15.00	0.00	15.00
Flexibility	5.63	3.94	22.00	0.00	22.00
Originality - Clever	.67	1.46	12.00	0.00	12.00
Sensitivity	15.14	5.42	30.00	0.00	30.00
Originality- Remote	1.00	1.42	13.00	0.00	13.00
Fluency	8.23	4.16	29.00	0.00	29.00
Total Pre-Test	36.16	13.48	88.00	4.00	84.00
POST-TESTS					
Redefinition	6.87	2.97	15.00	0.00	15.00
Flexibility	8.73	4.58	23.00	0.00	23.00
Originality- Clever	1.43	2.09	14.00	0.00	14.00
Sensitivity	16.95	5.57	30.00	0.00	30.00
Originality- Remote	2.48	2.34	14.00	0.00	14.00
Fluency	11.03	4.94	27.00	0.00	27.00
Total Post-Test	47.55	16.74	93.00	3.00	90.00

TABLE 29. SUMMARY OF OBSERVATION DATA FOR THE SAMPLE USED IN THE INVESTIGATION (N = 270)

Item		Mean	S.D.	Maximum	Minimum	Range
Motive Climate	(AA)	3.67	.70	5.00	1.75	3.25
Pupil-Teacher	(BA)	2.34	.94	4.75	-1.00	5.75
Teacher-Pupil	(BB)	2.76	.96	4.00	-1.00	5.00
Pupil-Pupil	(BC)	.87	.77	3.00	-1.50	4.50
Total Climate		9.47	2.31	15.88	2.25	13.63
Initiative	(AD)	1.90	.51	4.00	1.00	3.00
Approach	(BD)	2.35	.98	4.50	-2.00	6.50
Adaptation	(CA)	11.13	5.54	29.00	1.12	27.88
Variation	(DA)	5.85	1.75	11.00	1.00	10.00
Total General Structure		21.27	6.33	37.63	4.38	33.25
Divergency	(AC)	2.13	.92	4.88	1.00	3.88
Unusual Response	(CB)	1.26	1.93	13.00	0.00	13.00
Uniqueness	(AB)	1.03	.21	3.50	1.00	2.50
Total Specific Structure		4.44	2.66	18.16	2.00	16.16
Grand Total		35.19	8.77	58.00	11.38	46.62

TABLE 30. MEAN OBSERVATION SCORES ASSIGNED EACH CLASSROOM BY ALL OBSERVERS OVER ALL VISITS

Class	Climate					General Structure					Specific Structure				Grand Total
	AA	BA	BB	BC	Total	AD	BD	CA	DA	Total	AC	CB	AB	Total	
1	3.27	1.96	2.53	1.00	8.29	2.07	2.02	12.01	3.33	19.45	1.60	.88	1.00	3.49	31.24
2	3.77	3.20	3.59	.83	11.40	1.58	2.86	10.93	6.66	22.03	1.44	.44	1.00	2.88	36.33
3	3.69	2.34	3.11	.41	9.28	1.79	2.44	8.96	5.66	18.86	1.51	.22	1.00	2.73	30.88
4	3.93	1.00	3.23	1.00	8.51	1.78	1.90	6.23	4.66	14.59	1.59	.00	1.00	2.59	25.70
5	3.93	2.75	2.83	1.17	10.56	2.02	3.11	13.48	6.33	24.95	2.30	2.11	1.09	5.50	41.02
6	4.11	2.96	3.21	.97	11.15	1.84	3.00	22.11	5.00	31.95	2.36	2.66	1.00	6.03	49.14
7	3.66	2.97	2.91	.46	9.91	1.74	2.63	15.92	7.00	27.25	1.68	.11	1.00	2.79	39.96
8	4.14	2.43	3.50	.98	11.02	1.68	2.25	12.64	5.66	22.24	2.17	2.00	1.00	5.17	38.43
9	2.93	3.02	2.26	.76	8.80	1.42	.72	10.40	6.00	18.55	1.75	.00	1.09	2.85	30.20
10	4.63	3.01	3.36	1.79	12.80	2.69	3.05	11.10	4.66	21.52	4.32	5.88	1.29	11.50	45.84
11	3.68	2.54	3.06	.41	9.66	2.22	2.40	7.90	5.00	17.53	3.02	.66	1.00	4.25	31.44
12	3.70	2.19	2.26	.45	8.52	2.29	2.63	12.51	6.66	24.10	2.61	2.11	1.00	5.72	38.35
13	2.55	1.32	1.58	.05	5.51	1.26	1.51	7.94	6.00	16.72	1.54	.55	1.00	3.10	25.33
14	2.88	1.77	1.29	.65	6.61	2.09	1.71	9.28	5.66	18.76	2.20	.88	1.15	4.24	29.62
15	3.54	2.44	2.61	.36	8.83	1.61	2.61	8.49	7.00	19.71	2.37	1.33	1.33	5.04	33.59
16	3.91	2.86	3.18	1.06	10.90	2.01	2.70	17.44	6.33	28.49	1.69	.77	1.00	3.47	42.88
17	3.68	2.74	2.75	1.02	10.20	2.08	3.02	14.68	8.66	28.46	2.57	1.55	1.06	5.19	43.85
18	3.51	2.55	2.14	.86	9.07	1.97	2.48	9.09	5.33	18.88	2.39	1.22	1.00	4.61	32.57
19	3.59	1.31	2.51	.91	8.04	1.91	1.65	5.70	6.33	15.60	1.89	1.00	1.00	3.89	27.53
20	3.90	2.11	3.88	.73	10.31	1.91	2.58	11.66	5.66	21.83	1.79	.33	1.00	3.12	35.26

TABLE 30 (Continued)

Class	Climate					General Structure					Specific Structure				Grand
	AA	BA	BB	BC	Total	AD	BD	CA	DA	Total	AC	CB	AB	Total	Total
21	4.21	1.19	2.51	1.34	9.11	2.57	2.55	11.98	6.33	23.45	3.41	4.66	1.09	9.18	41.74
22	3.91	2.10	2.88	.50	9.11	1.68	1.95	6.94	5.66	16.25	1.16	.00	1.00	2.16	27.53
23	3.19	1.73	2.55	.54	8.02	1.70	2.36	9.42	7.00	20.49	1.65	.00	1.00	2.65	31.17
24	3.86	2.20	2.59	.86	9.51	2.13	2.65	10.47	4.33	19.59	2.58	1.88	1.00	5.47	34.58
25	3.87	2.55	2.94	.71	10.00	1.59	2.38	9.06	5.33	18.37	2.03	1.44	1.02	4.50	32.88
26	4.03	2.78	3.09	1.14	10.67	1.89	2.85	12.49	6.00	23.24	1.86	.44	1.00	3.31	37.22
27	2.80	2.30	2.26	.38	7.76	1.70	1.78	11.63	6.66	21.79	1.67	.22	1.00	2.89	32.45
28	3.94	2.27	2.95	1.18	10.36	2.17	2.70	7.04	8.00	19.95	2.43	1.66	1.00	5.10	35.42
29	4.62	3.44	3.66	2.29	13.77	2.45	3.55	11.70	6.00	23.71	3.34	3.11	1.00	7.45	44.95
30	2.60	2.23	1.67	.58	6.48	1.16	.91	14.80	2.66	19.55	1.04	.22	1.00	2.26	28.30

Appendix D

Peer Nomination and Interest Inventory Forms

WHO DOES IT ?

Name ______________________________ Date ______________________________

There are boys and girls in your class who have good ideas, who help out in emergencies, who suggest new ways of doing things. Answer the following questions as accurately as you can:

1. Who makes up new games ?

   (1) ______________________________

2. If something happened so that the boys and girls in your class couldn't do something special that you had planned to do, who would be the first to think up something else to do ?

   (1) ______________________________

3. If the boys and girls in your class were told to make up a new use for a stick, who would be first to find one ?

   (1) ______________________________

4. If you caught your foot in something, who would be the first to think of a way to get it out ?

   (1) ______________________________

5. Who does the most talking ?

   (1) ______________________________

6. Who is your best friend in this group ?

   (1) ______________________________

THINGS DONE ON YOUR OWN

DIRECTIONS: Below is a list of activities boys and girls sometimes do on their own. Indicate which ones you have done during this school term by checking the blank at the left. Include only the things you have done on your own, not the things you have been assigned or made to do.

( ) 1. Wrote a poem

( ) 2. Wrote a story

( ) 3. Wrote a play

( ) 4. Kept a collection of my writings

( ) 5. Wrote a song or jingle

( ) 6. Produced a puppet show

( ) 7. Kept a diary for at least a month

( ) 8. Played word games with other boys and girls

( ) 9. Used Roget's Thesaurus or some other book in addition to a dictionary

( ) 10. Recorded on a tape recorder an oral reading, dialogue, story, discussion, or the like

( ) 11. Found errors in fact or grammer in newspaper or other printed matter

( ) 12. Acted in a play or skit

( ) 13. Directed or organized a play or skit

( ) 14. Made up and sang a song

( ) 15. Made up a musical composition for some instrument

( ) 16. Made up a new game and taught it to someone else

E. Paul Torrance, GUIDING CREATIVE TALENT, ©1962. Reprinted by permission of Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

( ) 17. Pantomimed some story

( ) 18. Acted out a story with others

( ) 19. Wrote a letter to a member of family or a friend away from home

( ) 20. Made up an original dance

( ) 21. Played charades

( ) 22. Visited a zoo

( ) 23. Explored a cave

( ) 24. Read a science magazine

( ) 25. Read a science book

( ) 26. Mixed colors

( ) 27. Made a fire cracker

( ) 28. Printed photographs

( ) 29. Grew crystals

( ) 30. Made a leaf collection

( ) 31. Made a wildflower collection

( ) 32. Made an electric motor

( ) 33. Made a musical instrument

( ) 34. Planned an experiment

( ) 35. Dissected an animal

( ) 36. Grafted a plant or rooted one from a cutting

( ) 37. Distilled water

( ) 38. Used a magnifying glass

( ) 39. Made ink

( ) 40. Made leaf prints

( ) 41. Started a fire with a lens

( ) 42. Used a magnet

( ) 43. Raised rats, mice, rabbits, or guinea pigs

( ) 44. Collected insects

( ) 45. Collected rocks

( ) 46. Kept a daily record of weather

( ) 47. Been a bird watcher

( ) 48. Kept a science notebook

( ) 49. Kept a science scrapbook

( ) 50. Attended a science fair or display

( ) 51. Used a chemistry set

( ) 52. Produced static electricity

( ) 53. Constructed a model airplane

( ) 54. Designed a model airplane

( ) 55. Counted annual rings in a log

( ) 56. Made a stamp collection

( ) 57. Made a collection of post marks

( ) 58. Organized or helped to organize a club

( ) 59. Served as officer in a club organized by boys and/or girls

( ) 60. Figured out a way of improving a game we play at school or home

( ) 61. Figured out a way of improving the way we do something at home

( ) 62. Figured out a way of improving the way we do something at school

( ) 63. Figured out a way of improving the way we do something in a club, Scouts, etc.

( ) 64. Solved a problem about getting along with my parents

( ) 65. Solved a problem about getting along with other boys and girls

( ) 66. Helped act out some historical event

( ) 67. Found out about the history of my city or community

( ) 68. Found out about the way some government agency (post office, court, etc.) operates

( ) 69. Wrote a letter to someone in another country

( ) 70. Wrote a letter to someone in another state

( ) 71. Made a map of my community

( ) 72. Made my own decision about the use of money

( ) 73. Asked questions about the way some business operates

( ) 74. Made a poster for some club, school or other event

( ) 75. Organized or helped organize paper drive, rummage sale, etc.

( ) 76. Sketched landscape with pencil and/or charcoal

( ) 77. Designed stage settings for play or skit

( ) 78. Developed a design for jewelry

( ) 79. Developed a design for cloth

( ) 80. Illustrated a story of my own or one in a book

( ) 81. Took color photographs

( ) 82. Took black and white photographs

( ) 83. Made an illustrated map of a local community

( ) 84. Made plaster molds with which clay objects can be cast

( ) 85. Drew cartoons

( ) 86. Designed greeting card for some holiday or special event

( ) 87. Made linoleum cuts

( ) 88. Made block prints in color

( ) 89. Made a water color painting of a familiar scene

( ) 90. Made an oil color painting of some type

( ) 91. Made animal figures in the paper sculpture technique or papier-mâché

( ) 92. Made a toy for a child

( ) 93. Built a scale model of a park, playground, farm, etc.

( ) 94. Made a wood carving

( ) 95. Made a soap carving

( ) 96. Made basket for ornamental purpose

( ) 97. Drew up plans for an invention, apparatus, etc.

( ) 98. Constructed a model of an invention, apparatus, etc.

( ) 99. Made up recipe for some kind of food dish (meat, salad, dessert, etc.)

( ) 100. Made up recipe for some kind of drink mixture

VITA

David Albert Denny was born in Greenwich, Connecticut on July 29, 1932. He attended elementary school in Cos Cob, Connecticut, completing his elementary and high school education in Milford, New York where he moved in 1942. He graduated from Milford Central School in 1950. In June, 1954, he received the B.S. degree in education from State University Teachers College, Oneonta, New York. The recipient of a fellowship from the State of Florida, he entered graduate work the following year at the University of Florida, Gainesville from which he received the M.A.E. degree in elementary administration and supervision in June, 1955. Following two years of military service in the United States Army, from July, 1955 to July, 1957, he began his teaching career at Delmar, New York teaching sixth grade in the Bethlehem Central School System where he taught from September, 1957 to June, 1961. In September, 1961 he was appointed Assistant Professor of Education at the State University College, Oneonta, New York. He began work in the Ed.D. program in elementary education at Indiana University in the summer of 1962 and returned in the summers of 1963 and 1964 while continuing in his position at Oneonta. In 1964 he was promoted to Associate Professor of Education at Oneonta. After nomination by the College at Oneonta, he was awarded a Danforth Teacher Grant to complete his doctoral program at Indiana during the summer of 1965, and the 1965-66 academic year, The Danforth Foundation reappointed him for the summer of 1966. He returned to Oneonta as Professor of Education in the Fall of 1966.

END.
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